



# Estudio de diluciones, cálculo estructural y de repercusiones ambientales del vertido proveniente de la EDAR de Sant Jordi-platja d'en Bossa, en el término municipal de Sant Josep de sa Talaia (Ibiza)

Nº Expediente: 07.07.02

ALICANTE

18 de diciembre de 2007

CONSULTORÍA

**mediterráneo**  
Servicios Marinos



CLIENTE

Agència Balear de l'Aigua  
i la Qualitat Ambiental



Govern de les Illes Balears

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## INTRODUCCIÓN

El presente informe da respuesta a los trabajos solicitados por la Agencia Balear del Agua a la empresa Mediterráneo Servicios Marinos, S.L, necesarios para la emisión del informe de repercusiones del emisario submarino de la EDAR *Sant Jordi-platja d'en Bossa*, de acuerdo con los criterios que los técnicos del Comité Red Natura han indicado.

Estos estudios, consisten en el cálculo de diluciones para los nuevos parámetros de calidad de la Ampliación de la EDAR, los cálculos estructurales del emisario que aseguren la resistencia de las conducciones a los nuevos caudales previstos y un análisis de las posibles repercusiones ambientales del vertido sobre la pradera de *Posidonia oceanica*.



**DOCUMENTO N°1.**  
**ESTUDIO DE DILUCIONES Y CÁLCULO ESTRUCTURAL**





***“ESTUDIO DE DILUCIONES Y CÁLCULO  
ESTRUCTURAL DEL EMISARIO D'EN BOSSA. SAN  
JOSEP DE SA TALAIA. IBIZA”***

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- 5 RESUMEN Y CONCLUSIONES

**ANEJOS**

- 1 ANEJO DE DILUCIONES
- 2 ANEJO HIDRÁULICO



## MEMORIA

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# MEMORIA

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## 1. Introducción.

El emisario d' En Bossa fue construido en 1992 por la empresa Dragados y Construcciones. Este emisario parte de la red de emisarios existente en la isla de Ibiza, y está situado en el término municipal de Sant Joseph de Sa Talaia, aunque principalmente da servicio al término municipal de Ibiza en la zona de la playa d'En Bossa. Su cometido es la eliminación de los excedentes de agua tratada en la depuradora de Sant Jordi-Ibiza.

El agua residual urbana proveniente de la playa d'En Bossa llega a la planta depuradora a través de la red de colectores generales, impulsada por cuatro estaciones de bombeo conectadas en cascada. La evacuación del efluente se realiza gravitacionalmente hacia la estación de bombeo nº4, desde ahí se impulsa el caudal por medio de una conducción en fibrocemento  $\phi 400$  mm. de 471 metros de longitud en su tramo terrestre y de 1621 m. en su tramo marino .

La depuradora de Sant Jordi- playa d'En Bossa entró en funcionamiento en 1992, siendo el sistema de depuración empleado el de fangos activos convencional. Este sistema de tratamiento secundario es el encargado de reducir la DBO de las aguas residuales, empleando procesos de oxidación biológica. En 1995 se llevó a cabo una ampliación en la cual se incorporó un tratamiento terciario de nitrificación- desnitrificación, que elimina total o parcialmente el nitrógeno orgánico o amoniacal.

Esta depuradora, además de tratar las aguas residuales de los núcleos de Sant Jordi-playa d'En Bossa, dispone de una instalación de tratamiento del vaciado de fosas sépticas.

A finales del año 2001, se realiza una adecuación y limpieza del emisario para mejorar la salida del efluente por los difusores, configuración que conserva hasta ahora.

Debido al paulatino incremento de caudales depurados en la EDAR, el IBASAN encarga este estudio para conocer cuál será el comportamiento hidráulico y sobre todo de diluciones del efluente en los escenarios de futuro cercano y lejano previstos, ya que según el ritmo de

incremento actual, se espera un caudal para 2017 de 5900 m<sup>3</sup>/día, siendo el actual de 3000 m<sup>3</sup>/día.

Este estudio viene a comprobar la validez de la instalación ante el aumento de caudal, no solo técnicamente mediante un estudio hidráulico de la misma sino también medioambientalmente por medio un estudio de diluciones del efluente futuro.

## **2. Descripción de los estudios realizados**

Para el cálculo de las diluciones del efluente vertido por medio de la conducción submarina, se ha utilizado el nuevo programa de simulación “Visjet 2.0” desarrollado por departamento de Ingeniería Civil de la Universidad de Hong Kong, el cual está basado en modelos matemáticos y en experiencias más actuales.

Se han estudiado también las diluciones obtenidas con el modelo “Cormix” desarrollado por la U.S. E.P.A. (United States Environmental Protection Agency); institución de probado prestigio internacional, y ampliamente utilizado hasta la fecha, pero el modelo Visjet 2.0 tiene algunas mejoras debido a ser un desarrollo más actual.

Se han analizado y procesado en el modelo los distintos casos que se podrían generar, combinando distintos medios receptores, velocidades de corrientes y variedad de caudales.

El cálculo de las pérdidas hidráulicas en el emisario y en el difusor, se ha realizado mediante un programa basado en Excel, habiéndose calculado las pérdidas para varios caudales.

Dicho programa de cálculo se basa en las formulaciones de pérdidas por fricción de Manning – Stickler y en los algoritmos de Brooks para la distribución de caudales en los difusores.

A las pérdidas en el emisario submarino, se le han añadido las de la conducción en el tramo terrestre, de manera que se puedan aplicar para los dimensionamientos de los equipos de bombeo para el futuro.

### 3. Estudio de diluciones

Como ya se ha comentado anteriormente, el modelo empleado se denomina “Visjet. Computer Ocean Outfall Modeling System” que se ha desarrollado en la Universidad de Hong Kong. Este modelo es de última generación, ya que está basado en el desarrollo matemático JETLAG (LAGrangian JET).

El modelo JETLAG permite manejar una chorro arbitrariamente inclinado afectado por una corriente, con una trayectoria en 3-D. El modelo Langragiano en el que está basado, parte de unas consideraciones diferentes al modelo Euleriano, ya que con el primero se traza la evolución media de la pluma por conservación de momento vertical y horizontal.

Este nuevo modelo está basado en las experimentaciones con las nuevas técnicas de ensayo no intrusivas de fluorescencia láser inducida y las técnicas de procesamiento digital de imágenes, junto con los nuevos modelos 2D/3D de turbulencia, se desarrolló aún más las capacidades y la precisión de simulación del modelo JETLAG.

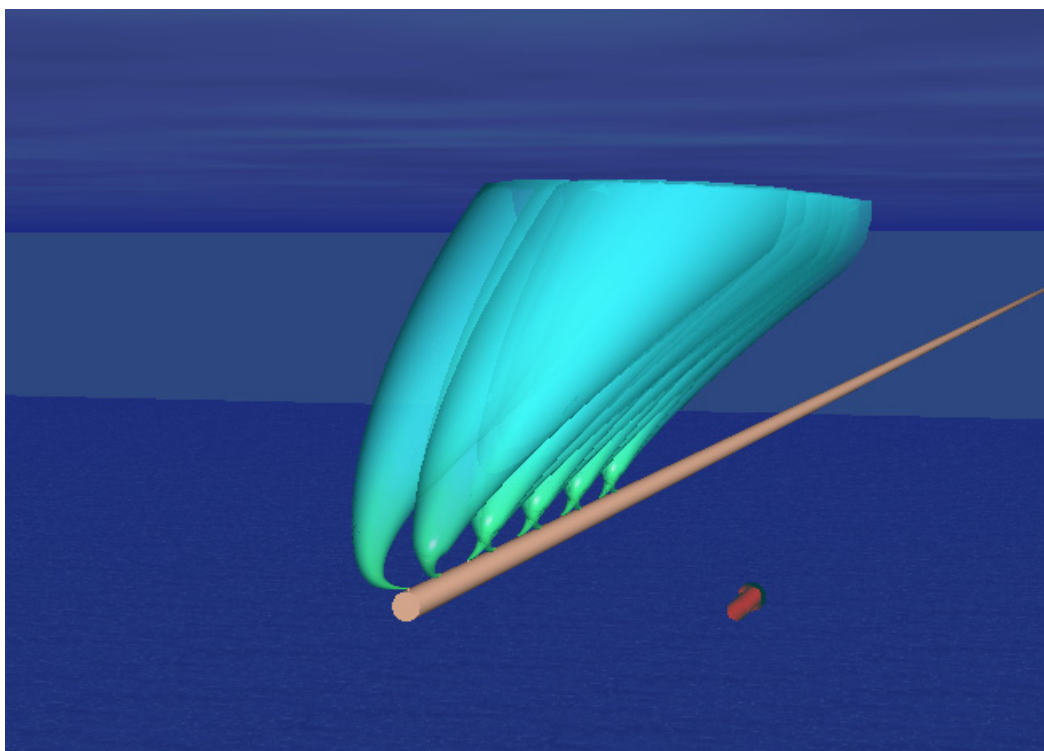
A modo de comparativo se ha utilizado también el modelo Cormix “The Cornell Mixing Zone Expert System (Cormix)” Versión 3.2. Dicho software fue desarrollado en el marco del acuerdo conjunto de la “Cornell University. Defrees Hydraulics Laboratory. Ithaca, New York” y la U.S.E.P.A. (United States Environmental Protection Agency).

#### 3.1. Casos analizados

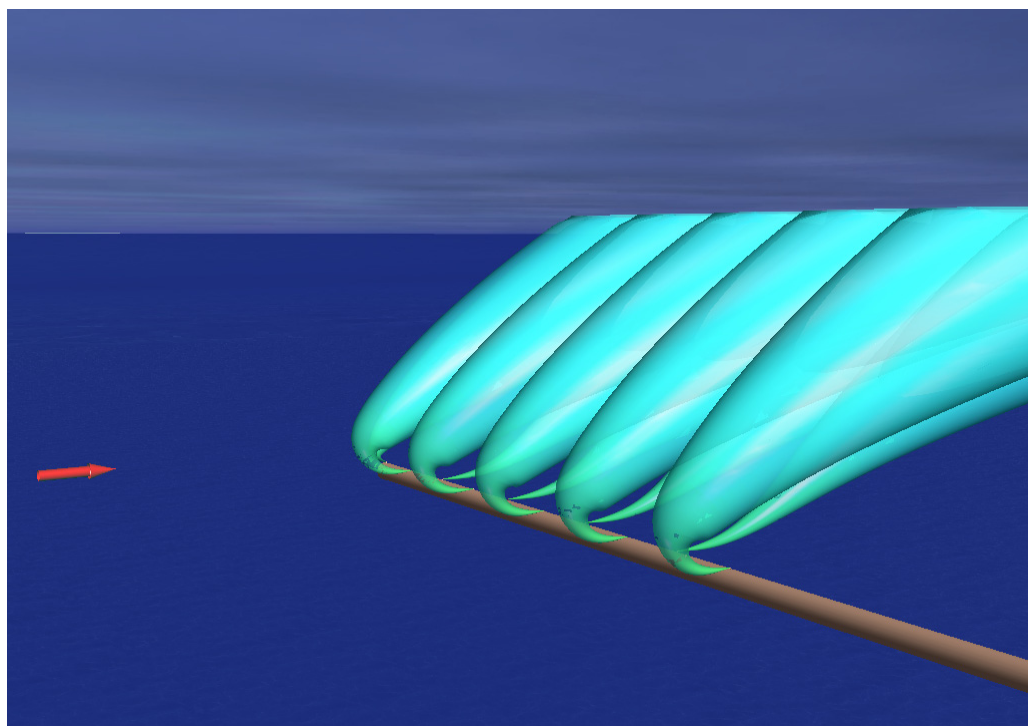
Se han analizado las diluciones en varios casos y con variación de parámetros para la configuración actual del emisario, considerando los caudales actuales de 50 l/s y de 100 l/s y para futuro cercano y lejano de 150 l/s y 200 l/s respectivamente.

Para el ángulo de incidencia de las corrientes estacionarias (de deriva o termohalinas en su caso, etc) al difusor, se han considerado dos escenarios: uno con la corriente perpendicular al difusor ( $\gamma = 90^\circ$ ) que es la situación usual, y otro caso con la corriente formando un ángulo ( $\gamma = 0^\circ$ ) en dirección a la costa, escenario nada habitual pero es el más desfavorable que

pueda ocurrir. Se adjuntan imágenes de las dos situaciones realizadas mediante el programa Visjet 2.0.



*Escenario 1. Corriente 0° (Simulación 19)*



*Escenario 2. Corriente 90° (Simulación 15)*

En el caso de las velocidades de las corrientes estacionarias (de deriva o termohalinas en su caso, etc), se han analizado dos corrientes: La primera es una velocidad baja de corriente ( $U_a = 0.1$  m/s); la segunda es un valor algo más elevado ( $U_a = 0.2$  m/s).

El medio receptor se ha considerado entre todas las posibles variaciones, las dos extremas principales que se producen a lo largo del año, estratificado (en verano) y no estratificado (invierno).

Se ha analizado los distintos caudales que se podrían verter por la conducción, definiendo una gama de situación actual de futuro cercano y lejano. Para las situaciones de futuro previstas, se han estudiado cuatro caudales distintos, empezando por un caudal de  $0.05$  m<sup>3</sup>/s y de  $0.1$  m<sup>3</sup>/s de efluente depurado de la EDAR en situación actual, y para las situaciones de futuro y futuro lejano se han considerado unos caudales de  $0.15$  m<sup>3</sup>/s y  $0.2$  m<sup>3</sup>/s respectivamente. No obstante se han calculado con los distintos modelos de cálculo de dilución una gama distinta de caudales. Con el modelo Cormix se han evaluado los caudales 50, 100 y 150 l/s, con el modelo Visjet 2.0 se han evaluado los caudales 100, 150 y 200 l/s.

Para la distribución geométrica se ha considerado la configuración actual del emisario, es decir, las salidas equidistantes en todo lo largo del difusor, siendo en total 10 difusores por medio de orificios laterales alternativos de 60 mm. de diámetro, con una boca final de igual diámetro al resto de los nueve difusores.

Se han evaluado los datos de partida tanto ambientales en los dos posibles escenarios del medio receptor, estratificado en verano y no estratificado en invierno, se exponen de forma resumida en los siguientes apartados.

- Parámetros medioambientales del medio receptor.

Se parte de los datos obtenidos en los estudios previos concretando en los siguientes aspectos:

Profundidad media: 30 m.

Profundidad de vertido: 29.5 m.

Estratificación de densidad: lineal.



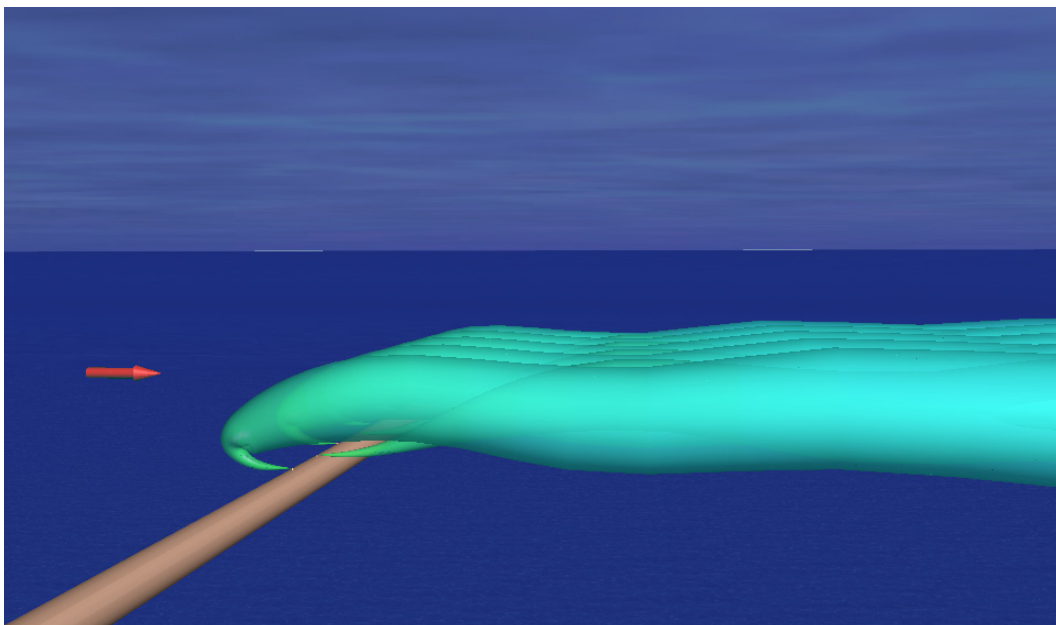
Densidad perfil estratificado (verano):

- Superficie:  $1024.8 \text{ kg/m}^3$ . ( $25^{\circ}\text{C}$  S=37ppt)
- Fondo:  $1028 \text{ kg/m}^3$ . ( $18^{\circ}\text{C}$  S= 38.5 ppt)

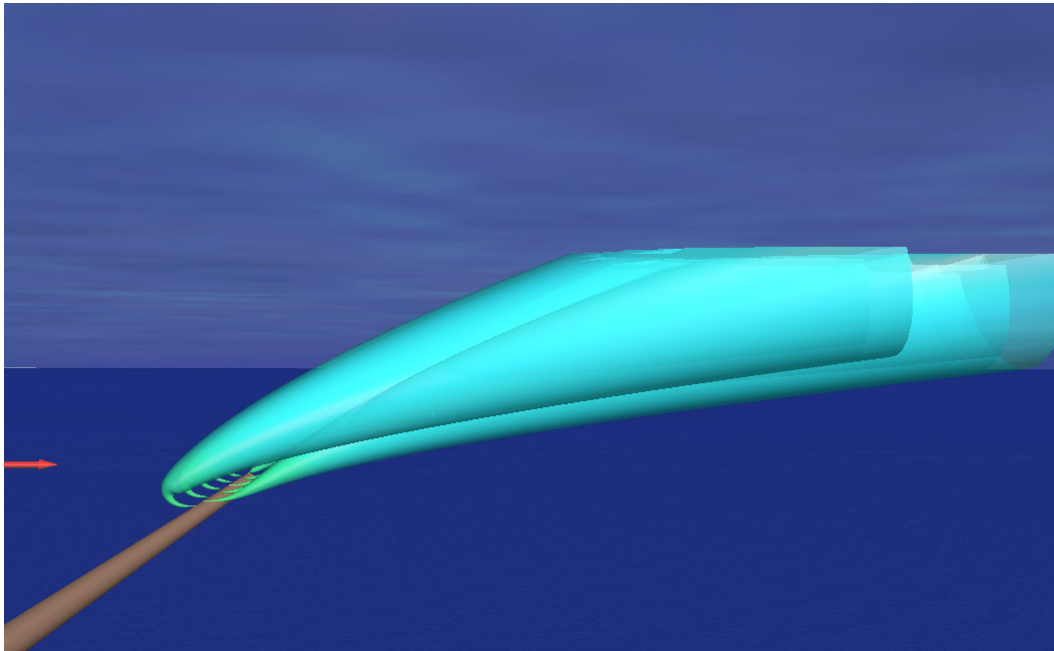
Densidad perfil sin estratificar (invierno):

- Superficie:  $1026 \text{ kg/m}^3$ . ( $14^{\circ}\text{C}$  S= 35 ppt)
- Fondo:  $1026 \text{ kg/m}^3$ . ( $14^{\circ}\text{C}$  S= 35 ppt)

Se adjuntan a continuación imágenes de la simulación que muestran claramente el comportamiento de la pluma en los dos escenarios de estratificación del medio receptor. En el caso de medio estratificado (verano) la pluma queda atrapada verticalmente a unos metros de la salida y no llega a la superficie; en el caso del medio sin estratificar (invierno) la pluma se desarrolla verticalmente hasta que alcanza la superficie. Ambos ejemplos son con idénticos caudales y velocidad de corriente, de modo que se compare equitativamente ambos casos.



*Caso I. Estratificado (simulación 1)*



*Caso II. Sin estratificar (simulación 13)*

- Parámetros geométricos del difusor.

\* Geometría lineal:

Longitud del difusor: 60 m.

Distancia a costa de la primera boca difusora: 1621 m.

Número de bocas difusoras: 10.

Diámetro de los risers/bocas difusoras: 0.06 m.

Altura sobre el fondo de la boca difusora: 0.25 m.

Tipo de difusor: multipuertos con 1 salida horizontal.

- Parámetros y características del efluente a verter.

Tipo de efluente a verter: agua depurada procedente de la depuradora equipada con terciario.

Situación actual:

- Agua depurada:

$Q = 0.05$  y  $0.1 \text{ m}^3/\text{s}$

Densidad =  $995 \text{ Kg/m}^3$

Situación futuro cercano:

- Agua depurada:  
 $Q = 0.15 \text{ m}^3/\text{s}$   
Densidad =  $995 \text{ Kg/m}^3$

Situación futuro lejano:

- Agua depurada:  
 $Q = 0.2 \text{ m}^3/\text{s}$   
Densidad =  $995 \text{ Kg/m}^3$

El análisis de estas variables en varios casos, nos genera una combinación de 24 simulaciones descritas en el anejo para cada modelo.

### **3.2. Resultados de diluciones obtenidos**

Según se desprende de las tablas y listados obtenidos de las distintas simulaciones que se encuentran en el anejo, y según lo esperado, el efluente al ser de menor densidad que el medio, sube hacia la superficie, lo que se denomina “pluma positivo”, pero debido a que la diferencia de densidad del medio según sea estratificado o no, implicará la ascensión a menor altura o a mayor, respectivamente, llegando en el caso de no estratificación a elevarse el efluente hasta la superficie.

Respecto a las diluciones obtenidas, se está en buena situación en todos los casos, no siendo inferiores nunca a 210 a una distancia de 20 m. Pero los resultados numéricos obtenidos son distintos según el tipo de medio receptor, ya que en el medio estratificado la pluma queda atrapada a cierta profundidad, por lo que se obtienen menores diluciones en comparación con el escenario de medio receptor sin estratificar, en el que se obtienen diluciones más del doble (a una distancia de 20 m.) que en caso de escenario estratificado. A igualdad de parámetros, el modelo Visjet, calcula una dilución algo mayor.

**EMISARIO D'EN BOSSA (SAN JOSEP DE SA TALAIA, IBIZA)**

*diluciones a 20 m.*

| Casos         | Estratificado | Casos         | Sin Estratificar |
|---------------|---------------|---------------|------------------|
| Simulación 1  | 328           | Simulación 13 | 944              |
| Simulación 2  | 270           | Simulación 14 | 648              |
| Simulación 3  | 227           | Simulación 15 | 450              |
| Simulación 4  | 302           | Simulación 16 | 578              |
| Simulación 5  | 251           | Simulación 17 | 440              |
| Simulación 6  | 211           | Simulación 18 | 353              |
| Simulación 7  | 327           | Simulación 19 | 944              |
| Simulación 8  | 269           | Simulación 20 | 647              |
| Simulación 9  | 226           | Simulación 21 | 450              |
| Simulación 10 | 303           | Simulación 22 | 449              |
| Simulación 11 | 251           | Simulación 23 | 578              |
| Simulación 12 | 210           | Simulación 24 | 440              |

*Resumen de diluciones obtenidas con el modelo Visjet 2.0 :*

**EMISARIO D'EN BOSSA (SAN JOSEP DE SA TALAIA, IBIZA)**

**Resumen de diluciones inicial (NFR)**

**Diluciones Modelo *Cormix*. Caso I Estratificado**

**Ángulo de corriente =90°**

| Q (l/s) | Dilución inicial |          |
|---------|------------------|----------|
|         | Vc = 0.2         | Vc = 0.1 |
| 50      | 286              | 209      |
| 100     | 225              | 157      |
| 150     | 194              | 132      |

**Ángulo de corriente =0°**

| Q (l/s) | Dilución inicial |          |
|---------|------------------|----------|
|         | Vc = 0.2         | Vc = 0.1 |
| 50      | 277              | 192      |
| 100     | 215              | 142      |
| 150     | 184              | 118      |

**Diluciones Modelo *Visjet*. Caso I Estratificado**

**Ángulo de corriente =90°**

| Q (l/s) | Dilución inicial |          |
|---------|------------------|----------|
|         | Vc = 0.2         | Vc = 0.1 |
| 100     | 302              | 328      |
| 150     | 251              | 270      |
| 200     | 211              | 227      |

**Ángulo de corriente =0°**

| Q (l/s) | Dilución inicial |          |
|---------|------------------|----------|
|         | Vc = 0.2         | Vc = 0.1 |
| 100     | 303              | 327      |
| 150     | 251              | 269      |
| 200     | 210              | 226      |

**Resumen de diluciones obtenidas con el modelo *Cormix* y *Visjet* 2.0 en medio estratificado**

Las diluciones del modelo *Visjet* están tomadas a 20 m. que serían asemejables a la dilución inicial. En el modelo *Cormix* solo se han calculado en el escenario de medio receptor estratificado, ya que presenta inestabilidad en los resultados para el caso de medio sin estratificar. El modelo *Visjet* 2.0 presenta resultados estables y se han calculado las diluciones para los dos escenarios.

**Diluciones Modelo *Visjet*. Caso II Sin estratificar**

**Ángulo de corriente =90°**

| Q (l/s) | Dilución inicial |          |
|---------|------------------|----------|
|         | Vc = 0.2         | Vc = 0.1 |
| 100     | 578              | 944      |
| 150     | 440              | 648      |
| 200     | 353              | 450      |

**Ángulo de corriente =0°**

| Q (l/s) | Dilución inicial |          |
|---------|------------------|----------|
|         | Vc = 0.2         | Vc = 0.1 |
| 100     | 449              | 944      |
| 150     | 578              | 647      |
| 200     | 440              | 450      |

*Resumen de diluciones obtenidas con el modelo Visjet 2.0 en medio sin estratificar*

#### 4. Cálculos hidráulicos

Los datos introducidos en el programa de cálculo son iguales en todos los casos, a excepción del caudal a verter que varía en los distintos casos, se han analizado los caudales 100, 150 y 200 l/s, como valores de efluente a verter por el emisario según los datos proporcionados por el IBASAN de los caudales actuales y futuros previstos.

Para los cálculos hidráulicos se han considerado en los parámetros geométricos del difusor los siguientes:

Longitud tubo principal conducción marina = 1662 m.

Longitud tubo principal conducción terrestre = 471 m.

Longitud tramo difusor = 60 m.

Nº de bocas difusoras = 10.

Diámetro interior del tramo difusor = variable (0.4, 0.35, 0.3, 0.25, 0.15 m.)

Diámetro interior tubo principal conducción = 0.4 m.

Diámetro de bocas de salida = 0.06 m.

Por otro lado, se ha aplicado el coeficiente de Manning para el cálculo de pérdidas por fricción en la tubería de Fibrocemento suele tener el valor de 0.09, aún así, se ha optado

por aumentar el coeficiente previendo las posibles pérdidas producidas por el envejecimiento o crecimiento marino en la conducción submarina.

Por lo que el coeficiente “n” de Manning adoptado es de 0.010 cumpliendo perfectamente, situándonos dentro de un margen de seguridad razonable.

Respecto a los valores de pérdidas en los distintos elementos del difusor, tales como reducciones, pérdidas localizadas etc., se adjunta la tabla de datos que se han introducido en el programa de cálculo.

**CALCULO HIDRAULICO DE EMISARIOS.**

oct-07

**Emisario D' En Bossa (Ibiza). Conduccion FC**

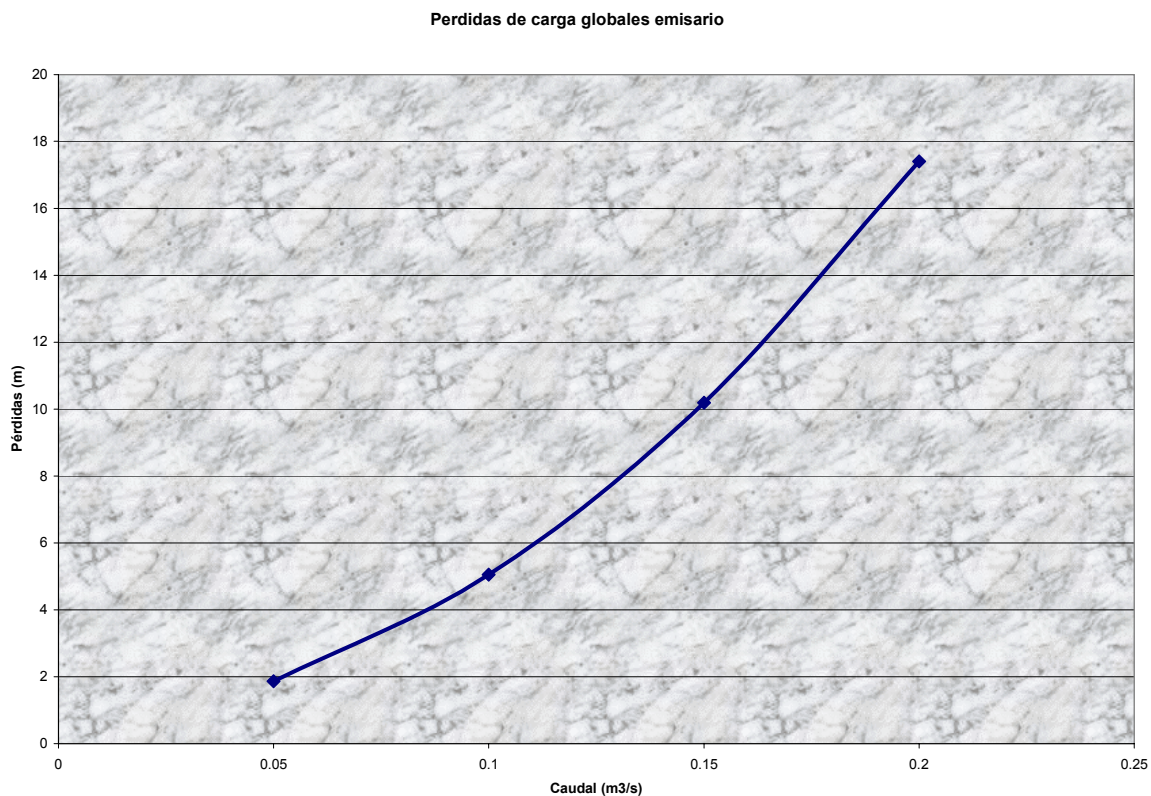
**PARAMETROS BASICOS**

|   |          |               |
|---|----------|---------------|
| Q: - CAUDAL DE CALCULO.                       | (m³/s)   | <b>0.200</b>  |
| M: - NUMERO DE MANNING                        |          | <b>0.010</b>  |
| Pe: - PESO ESPECIFICO DEL EFLUENTE.           | (kgs/m³) | <b>995</b>    |
| Pew: - PESO ESPECIFICO DEL AGUA DE MAR.       | (kgs/m³) | <b>1026</b>   |
| s: - SEPARACION ENTRE DIFUSORES.              | (m)      | <b>6.67</b>   |
| m: - PENDIENTE ZONA DE DIFUSORES.             |          | <b>0.0010</b> |
| H: - PROFUNDIDAD DE VERTIDO. (EN PLEAMAR)     | (m)      | <b>30.00</b>  |
| n: - Nº DE BOCAS DE DIFUSION POR RISER.       |          | <b>1</b>      |
| Kr: - COEF. PERD. LOCALIZADAS EN REDUCCIONES  |          | <b>0.18</b>   |
| Ks: - COEF. PERD. LOCALIZADAS EN CODOS RISERS |          | <b>0.00</b>   |
| Kc: - COEF. PERD. LOCALIZADAS ENTRADA RISERS. |          | <b>0.80</b>   |
| Kd: - COEF. PERD. CINETICA                    |          | <b>1.000</b>  |
| Kv: - COEF. PERD. LOCALIZADAS EN VALVULAS     |          | <b>0</b>      |

#### 4.1. Resultados Obtenidos

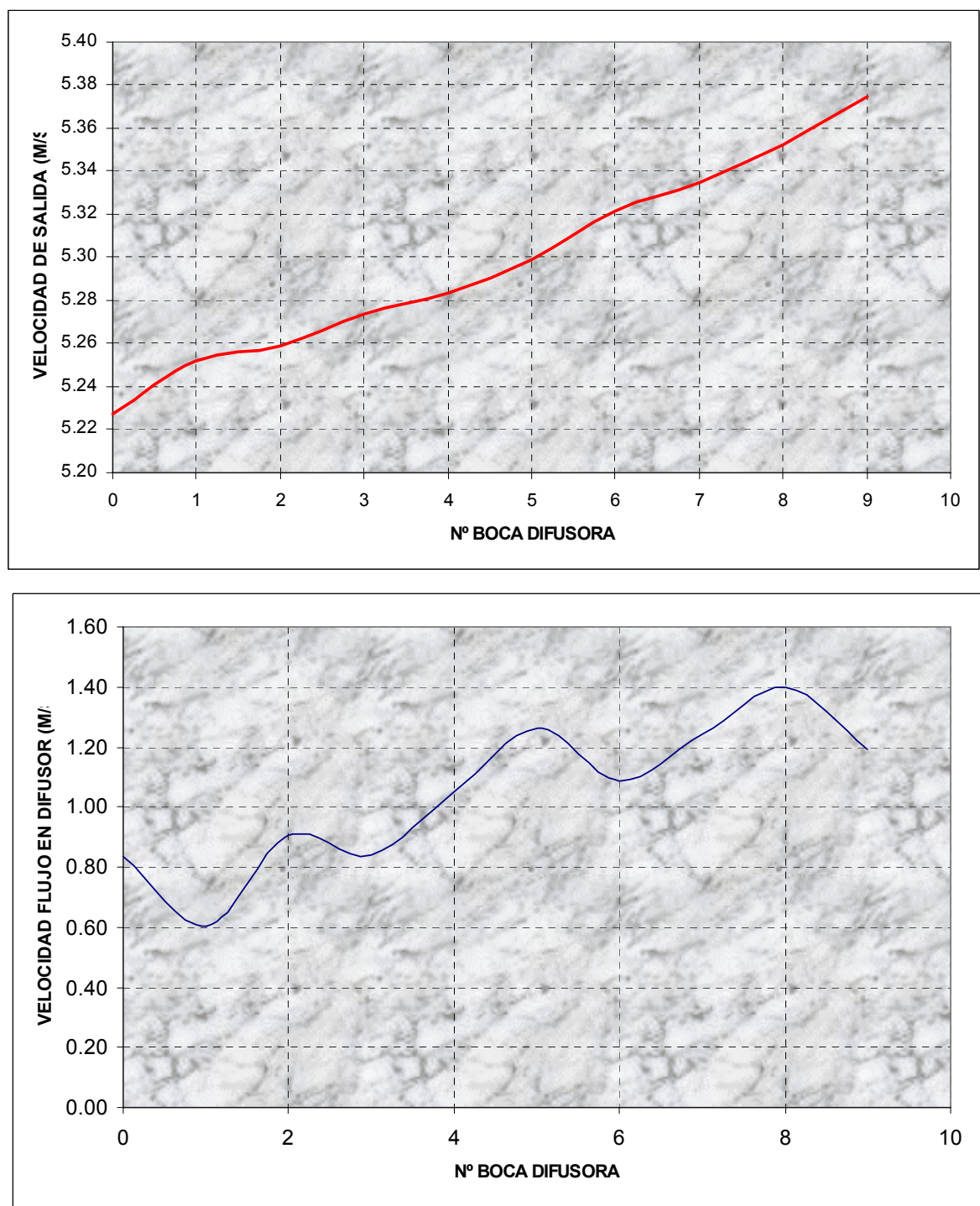
Tal como se observa en el anejo hidraulico donde figuran los listados del programa de cálculo, se observa que para un caudal máximo de futuro lejano de 0.2 m<sup>3</sup>/s se tienen unas pérdidas totales de 17.40 m. , siendo además para este caudal la velocidad en el tubo difusor del orden de 0.8 – 1.6 m/s.

En el caso de caudales más cercanos a la actualidad (0.1 m<sup>3</sup>/s en verano) las pérdidas totales se sitúan en el orden de 5.00 m., siendo las velocidades medias en el tubo difusor de 0.8 m/s.



*Pérdidas de carga globales del emisario*





*Velocidades en bocas y difusor para  $Q = 0.15 \text{ m}^3/\text{s}$*

## 5. Resumen y conclusiones

1. Como ya se ha explicado y según se puede deducir de las tablas resumen y de los listados de las simulaciones, Para el caso de una corriente a  $90^\circ$  (que será el caso habitual), y para caudales de futuro cercano, es decir,  $0.15 \text{ m}^3/\text{s}$ , con un medio estratificado y con la velocidad de corriente usual ( $0.10 \text{ m/s}$ ), las diluciones a 20 m de la salida del chorro están en el entorno de 250 en un medio estratificado. Esto significa que a 20 m. de la salida de los chorros, el efluente vertido se ha diluido en 249 partes
2. En el caso de tener el medio sin estratificación la dilución es de media 500 , Como se puede ver las diluciones del efluente a 20 m. de distancia son muy altas. Es necesario remarcar que estas diluciones son a 20 m. de distancia de la salida de los difusores, por lo cual a mayor distancia mejor será la dilución, aunque hay que precisar que para distancias mayores, las diluciones aumentan algo más lentamente, ver las gráficas de las simulaciones informáticas.
3. En el caso que se dieran caudales altos de futuro lejano ( $0.2 \text{ m}^3/\text{s}$ ) las diluciones son igualmente buenas, ya que estaríamos ante valores de dilución de 215 para el medio estratificado y de 400 para el medio no estratificado, siempre midiendo a 20 m. de la salida de los difusores.
4. Se tiene que todos los casos analizados tienen unas diluciones muy buenas siempre, mejorando bastante los valores de los límite legales de dilución inicial de 80 para estratificado y de 100 para no estratificado.
5. Hidráulicamente, las pérdidas totales superan ligeramente los 10 m. para un caudal de futuro cercano ( $Q = 0.15 \text{ m}^3/\text{s}$ ), siendo de 5 m. para un caudal actual de  $0.1 \text{ m}^3/\text{s}$ .
6. Para el caso de futuro lejano con un caudal de  $200 \text{ l/s}$ , las pérdidas se elevan a 17.4 m. aspecto que debería considerarse a los efectos de renovar los equipos de la estación de bombeo, ya que deben disponer una curva de caudal/elevación compatible con las pérdidas descritas.
7. Por otro lado la configuración de los difusores es adecuada para este emisario, ya que para los caudales evacuados, se consiguen unas velocidades en el tramo difusor de unos  $1.1 \text{ m/s}$ , que en promedio se encuentra próximo al  $1 \text{ m/s}$  recomendado. Asimismo la velocidad de salida de los chorros por los difusores es unos  $5 \text{ m/s}$  para un caudal de  $150 \text{ l/s}$ .

## ANEJO

## DILUCIONES

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## ANEJO

## DILUCIONES

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### **1. Introducción.**

Para el cálculo de las diluciones del efluente vertido por medio de la conducción submarina, se ha utilizado el nuevo programa de simulación “Visjet 2.0” desarrollado por departamento de Ingeniería Civil de la Universidad de Hong Kong, el cual está basado en modelos matemáticos y en experiencias más actuales.

Se han analizado y procesado en el modelo los distintos casos que se podrían generar, combinando distintos medios receptores, velocidades de corrientes y variedad de caudales.

### **2. Descripción del modelo matemático empleado.**

El modelo empleado se denomina “Visjet. Computer Ocean Outfall Modeling System” y como ya se ha comentado se ha desarrollado en la Universidad de Hong Kong. Este modelo es de última generación, ya que está basado en el desarrollo matemático JETLAG (LAGrangian JET).

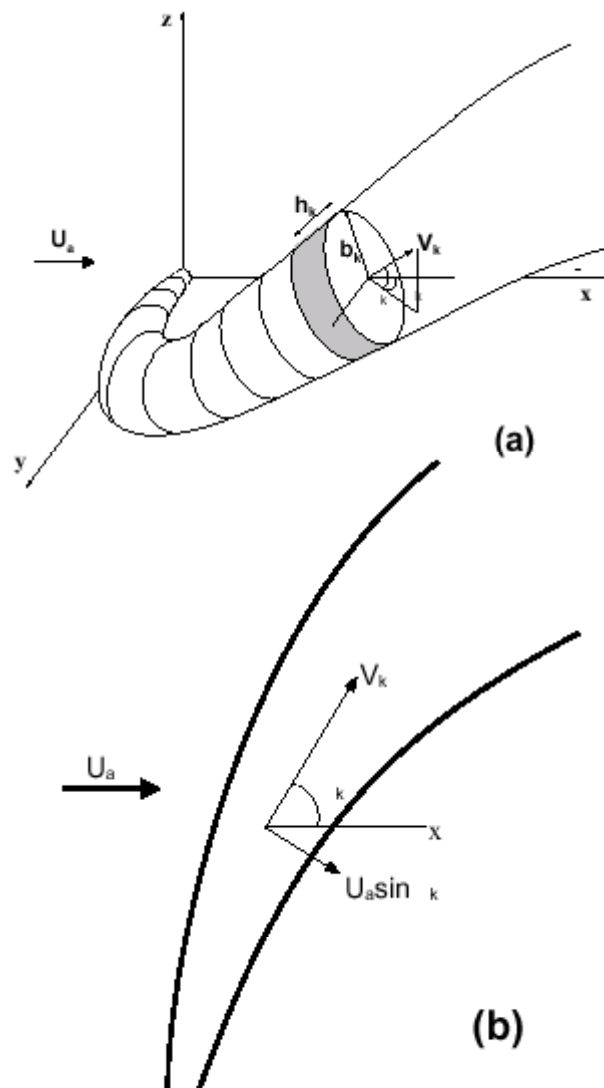
El modelo JETLAG permite manejar una chorro arbitrariamente inclinado afectado por una corriente, con una trayectoria en 3-D. El modelo Lagrangiano en el que está basado, parte de unas consideraciones diferentes al modelo Euleriano, ya que con el primero se traza la evolución media de la pluma por conservación de momento vertical y horizontal.

El nacimiento del modelo JETLAG se realiza con los estudios y desarrollo de la U.S.E.P.A. (United States Environmental Protection Agency) con el modelo

OUTPLM (Frick 1984; Muenlenhoff et. al 1985), el cual tenía algunas limitaciones con respecto al actual desarrollo del modelo JETLAG.

El nuevo desarrollo del modelo langragiano se realizó por (Lee and Cheung 1990; Cheung 1991; Cheung and Lee 1996, 1999), denominánse JETLAG, que eliminaba la mayoría de las limitaciones del desarrollo original. Más tarde con las nuevas técnicas de ensayo no intrusivas de fluorescencia láser inducida y las técnicas de procesamiento digital de imágenes, junto con los nuevos modelos 2D/3D de turbulencia, se desarrolló aún más las capacidades y la precisión de simulación del modelo JETLAG (Chu et al 1996; Chen and Lee 2000; Lee, Kuang and Chen 2002; Lee, Chen and Kuang 2002).

Se adjunta gráfico de parámetros en los que se basa el modelo Jetlag.



Se han estudiado también las diluciones obtenidas con el modelo “Cormix” desarrollado por la U.S. E.P.A. (United States Environmental Protection Agency); institución de probado prestigio internacional, y ampliamente utilizado hasta la fecha, pero el modelo Visjet 2.0 tiene algunas mejoras debido a ser un desarrollo más actual.

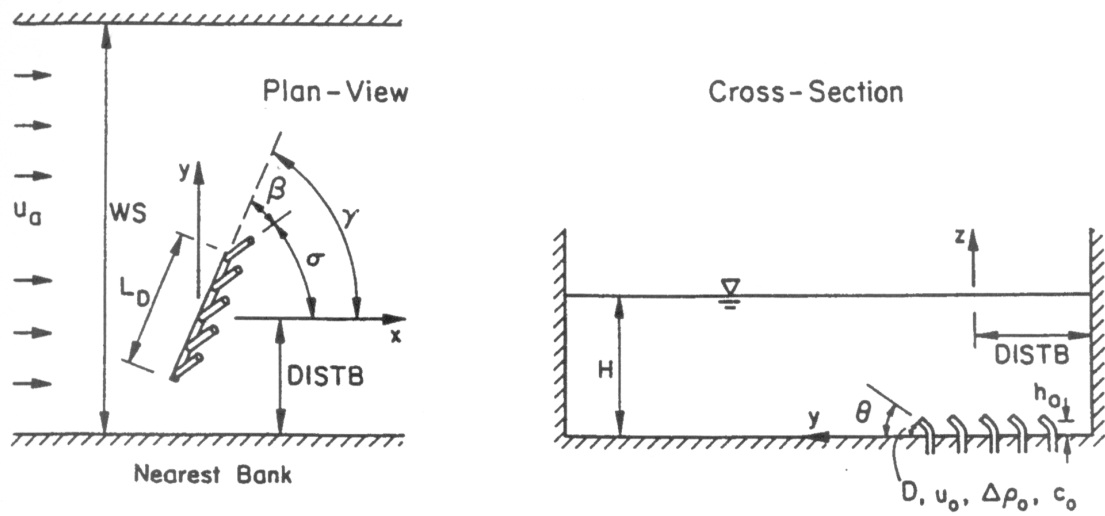
El programa “Cormix” está basado (al igual que modelos similares) en las experiencias y posterior desarrollo matemático de Brooks y más tarde de Roberts, resolviendo en definitiva las ecuaciones diferenciales Eulerianas de movimiento del flujo y transporte de masa.

Para diferenciar los posibles casos de vertido, el programa está estructurado en tres módulos: Cormix 1, Cormix 2 y Cormix 3, siendo respectivamente los vertidos de una sola salida, con varias salidas y vertido en superficie. En nuestro caso, como tenemos varios difusores, hemos utilizado el Cormix 2.

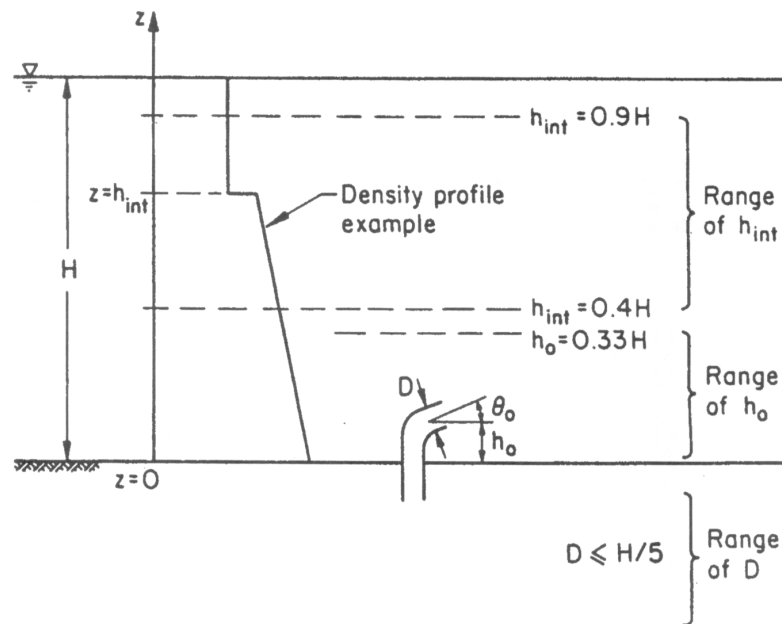
Para que el programa analice el caso propuesto, se le han de introducir los datos en tres bloques: el primero corresponde a los datos ambientales, tales como densidades del medio, velocidad de corrientes, etc.

El segundo bloque corresponde a la definición geométrica del difusor y de las características del efluente vertido; y el tercer bloque corresponde con los zonas en EE.UU. que la U.S. E.P.A. considera de riesgo, que en nuestro no son aplicables.

Se adjunta gráfico de los distintos parámetros y variables que utiliza “Cormix”.



a) Definition Diagram CORMIX2



b) Limits of Applicability CORMIX2

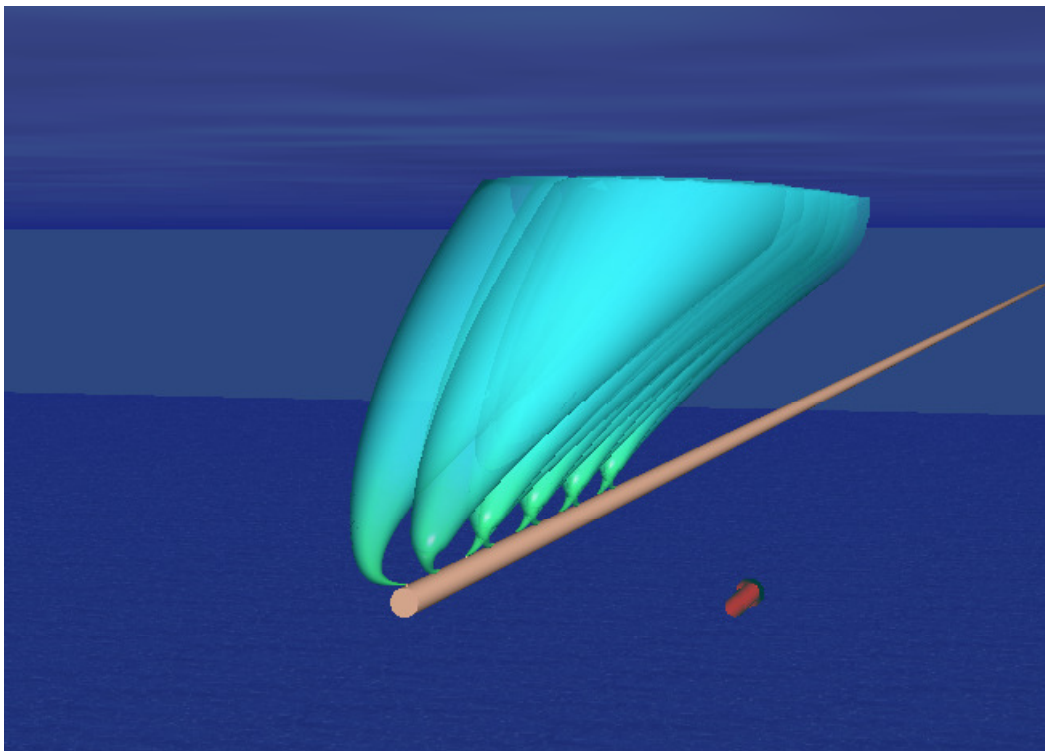
Figure 4.6: CORMIX2 discharge geometry and restrictions



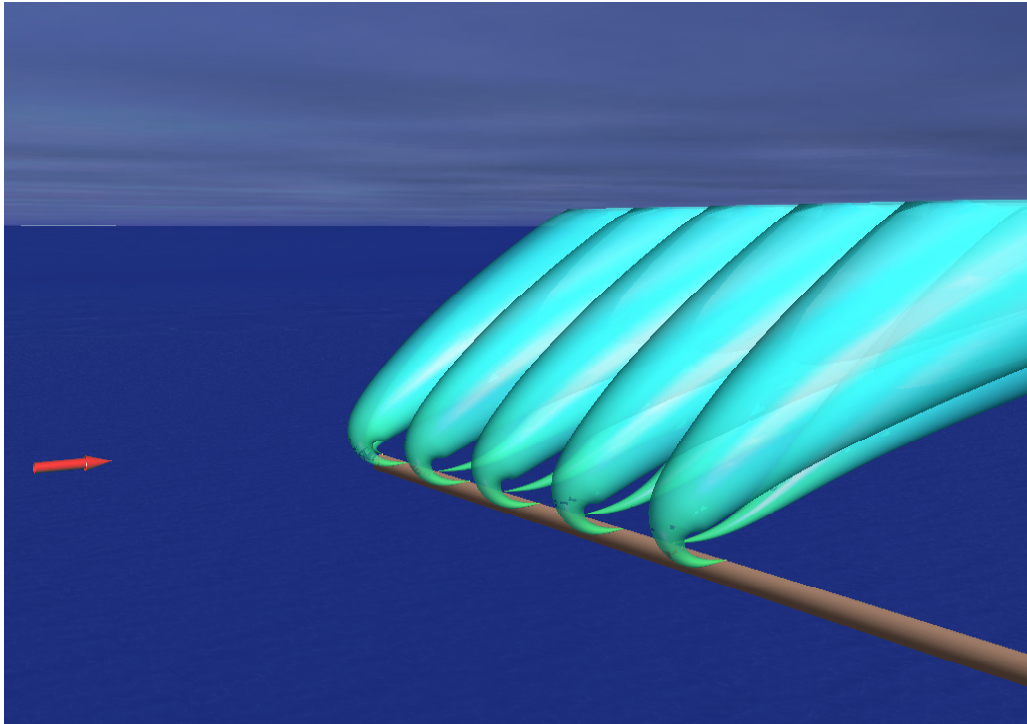
### **3. Casos analizados.**

Se han analizado las diluciones en varios casos y con variación de parámetros para la configuración actual del emisario, considerando los caudales de futuro.

Para el ángulo de incidencia de las corrientes estacionarias (de deriva o termohalinas en su caso, etc) al difusor, se han considerado dos escenarios: uno con la corriente perpendicular al difusor ( $\gamma = 90^\circ$ ) que es la situación usual, y otro caso con la corriente formando un ángulo ( $\gamma = 0^\circ$ ) en dirección a la costa, escenario nada habitual pero es el más desfavorable que pueda ocurrir. Se adjuntan imágenes de las dos situaciones realizadas mediante el programa Visjet 2.0



*Escenario 1. Corriente  $0^\circ$  (Simulación 19)*



*Escenario 2. Corriente 90º (Simulación 15)*

En el caso de las velocidades de las corrientes estacionarias (de deriva o termohalinas en su caso, etc), se han analizado dos corrientes: La primera es una velocidad baja de corriente ( $U_a = 0.1$  m/s); la segunda es un valor algo más elevado ( $U_a = 0.2$  m/s).

El medio receptor se ha considerado entre todas las posibles variaciones, las dos extremas principales que se producen a lo largo del año, estratificado (en verano) y no estratificado (invierno).

Se ha analizado los distintos caudales que se podrían verter por la conducción, definiendo una gama de situación actual de futuro cercano y lejano. Para las situaciones de futuro previstas, se han estudiado cuatro caudales distintos, empezando por un caudal de  $0.05$  m<sup>3</sup>/s y de  $0.1$  m<sup>3</sup>/s de efluente depurado de la EDAR en situación actual, y para las situaciones de futuro y futuro lejano se han considerado unos caudales de  $0.15$  m<sup>3</sup>/s y  $0.2$  m<sup>3</sup>/s respectivamente. No obstante se han calculado con los distintos modelos de cálculo de dilución una gama distinta

de caudales. Con el modelo Cormix se han evaluado los caudales 50, 100 y 150 l/s, con el modelo Visjet 2.0 se han evaluado los caudales 100, 150 y 200 l/s.

Para la distribución geométrica se ha evaluado la situación actual del emisario, es decir, las salidas equidistantes en todo lo largo del difusor, siendo en total 10 difusores por medio de orificios laterales alternativos de 60 mm. de diámetro, con una boca final de igual diámetro al resto de los nueve difusores.

Se han considerado los datos de partida tanto ambientales en los dos posibles escenarios del medio receptor, estratificado en verano y no estratificado en invierno, se exponen de forma resumida en los siguientes apartados.

- Parámetros medioambientales del medio receptor.

Se parte de los datos obtenidos en los estudios previos concretando en los siguientes aspectos:

Profundidad media: 30 m.

Profundidad de vertido: 29.5 m.

Factor de fricción de Darcy – Weisbach: 0.025.

Estratificación de densidad: lineal.

Densidad perfil estratificado:

- Superficie:  $1024.8 \text{ kg/m}^3$ . (25°C S=37ppt)

- Fondo:  $1028 \text{ kg/m}^3$ . (18°C S= 38.5 ppt)

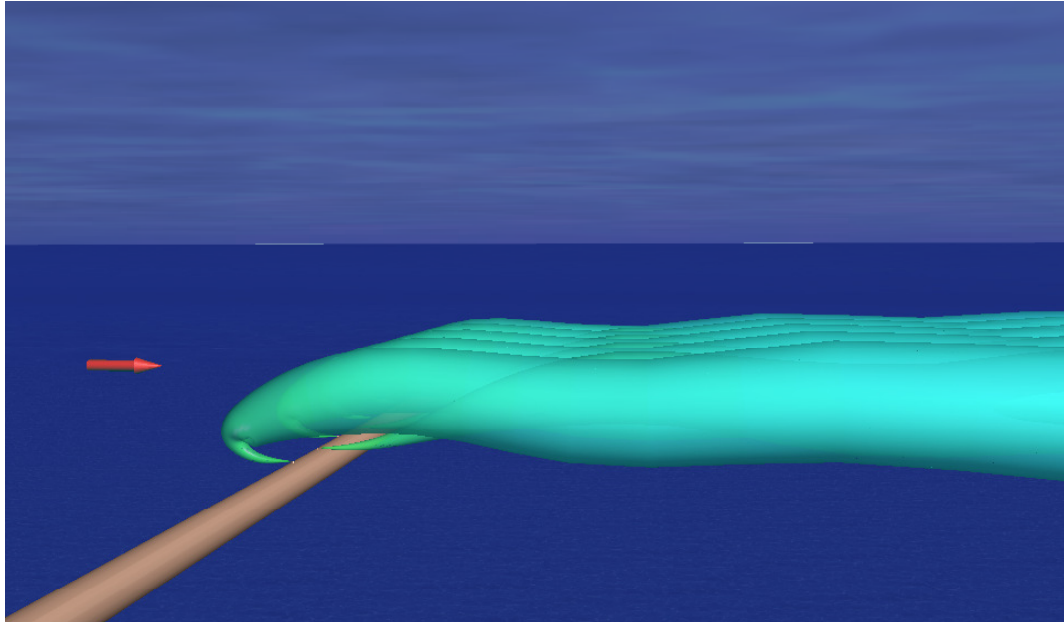
Densidad perfil sin estratificar:

- Superficie:  $1026 \text{ kg/m}^3$ . (14°C S= 35 ppt)

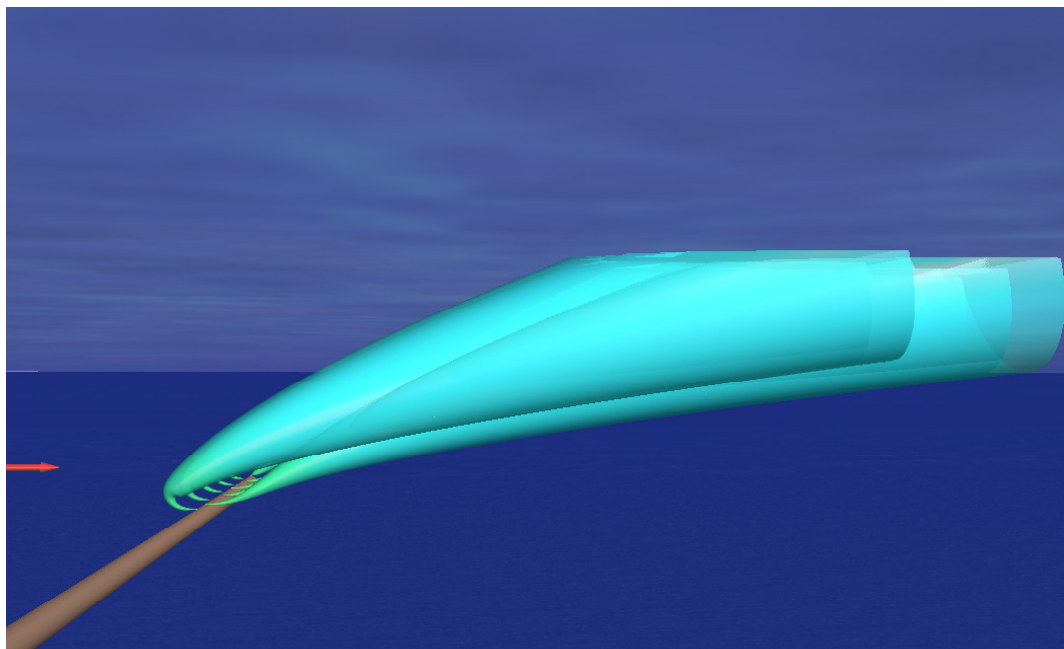
- Fondo:  $1026 \text{ kg/m}^3$ . (14°C S= 35 ppt)

Se adjuntan a continuación imágenes de la simulación que muestran claramente el comportamiento de la pluma en los dos escenarios de estratificación del medio receptor. En el caso de medio estratificado (verano) la pluma queda atrapada a una

profundidad media y no llega a la superficie; en el caso del medio sin estratificar (invierno) la pluma se desarrolla verticalmente hasta que alcanza la superficie.



*Caso I. Estratificado (simulación 1)*



*Caso II. Sin estratificar (simulación 13)*

- Parámetros geométricos del difusor.

\* Geometría lineal:

Longitud del difusor: 60 m.

Distancia a costa de la primera boca difusora: 1621 m.

Número de bocas difusoras: 10.

Diámetro de los risers/bocas difusoras: 0.06 m.

Altura sobre el fondo de la boca difusora: 0.25 m.

Tipo de difusor: multipuertos con 1 salida horizontal.

- Parámetros y características del efluente a verter.

Tipo de efluente a verter: agua depurada procedente de la depuradora

Situación actual:

- Agua depurada:

$$Q = 0.1 \text{ m}^3/\text{s}$$

$$\text{Densidad} = 995 \text{ Kg/m}^3$$

Situación futuro:

- Agua depurada:

$$Q = 0.15 \text{ m}^3/\text{s}$$

$$\text{Densidad} = 995 \text{ Kg/m}^3$$

Situación futuro lejano:

- Agua depurada:

$$Q = 0.2 \text{ m}^3/\text{s}$$

$$\text{Densidad} = 995 \text{ Kg/m}^3$$

El análisis de estas variables en varios casos, nos genera una combinación de simulaciones descritas a continuación para cada una de las situaciones estudiadas.

## **Caso I. Estratificado.**

### **I.1. $\gamma = 90^\circ$**

- I.1.1.  $V_c = 0.1 \text{ m/s}$ 
  - $Q = 100 \text{ l/s} \Rightarrow$  simulación 1.
  - $Q = 150 \text{ l/s} \Rightarrow$  simulación 2.
  - $Q = 200 \text{ l/s} \Rightarrow$  simulación 3.
  
- I.1.2.  $V_c = 0.2 \text{ m/s}$ 
  - $Q = 100 \text{ l/s} \Rightarrow$  simulación 4.
  - $Q = 150 \text{ l/s} \Rightarrow$  simulación 5.
  - $Q = 200 \text{ l/s} \Rightarrow$  simulación 6.

### **I.2. $\gamma = 0^\circ$**

- I.1.1.  $V_c = 0.1 \text{ m/s}$ 
  - $Q = 100 \text{ l/s} \Rightarrow$  simulación 7.
  - $Q = 150 \text{ l/s} \Rightarrow$  simulación 8.
  - $Q = 200 \text{ l/s} \Rightarrow$  simulación 9.
  
- I.1.2.  $V_c = 0.2 \text{ m/s}$ 
  - $Q = 100 \text{ l/s} \Rightarrow$  simulación 10.
  - $Q = 150 \text{ l/s} \Rightarrow$  simulación 11.
  - $Q = 200 \text{ l/s} \Rightarrow$  simulación 12.

## **Caso II. Sin estratificar.**

### **II.1. $\gamma = 90^\circ$**

- I.1.1.  $V_c = 0.1 \text{ m/s}$ 
  - $Q = 100 \text{ l/s} \Rightarrow$  simulación 13.
  - $Q = 150 \text{ l/s} \Rightarrow$  simulación 14.
  - $Q = 200 \text{ l/s} \Rightarrow$  simulación 15.
- I.1.2.  $V_c = 0.2 \text{ m/s}$ 
  - $Q = 100 \text{ l/s} \Rightarrow$  simulación 16.
  - $Q = 150 \text{ l/s} \Rightarrow$  simulación 17.
  - $Q = 200 \text{ l/s} \Rightarrow$  simulación 18.

### **II.2. $\gamma = 0^\circ$**

- I.1.1.  $V_c = 0.1 \text{ m/s}$ 
  - $Q = 100 \text{ l/s} \Rightarrow$  simulación 19.
  - $Q = 150 \text{ l/s} \Rightarrow$  simulación 20.
  - $Q = 200 \text{ l/s} \Rightarrow$  simulación 21.
- I.1.2.  $V_c = 0.2 \text{ m/s}$ 
  - $Q = 100 \text{ l/s} \Rightarrow$  simulación 22.
  - $Q = 150 \text{ l/s} \Rightarrow$  simulación 23.
  - $Q = 200 \text{ l/s} \Rightarrow$  simulación 24.

#### **4. Resultados Obtenidos.**

Según se desprende de las tablas y listados obtenidos de las distintas simulaciones, y según lo esperado, el efluente al ser de menor densidad que el medio, sube hacia la superficie, lo que se denomina “pluma positivo”, pero debido a que la diferencia de densidad del medio según sea estratificado o no, implicará la ascensión a menor altura o a mayor, respectivamente, llegando en el caso de no estratificación a elevarse el efluente hasta la superficie.

Respecto a las diluciones obtenidas, se está en buena situación en todos los casos, no siendo inferiores nunca a 210 a una distancia de 20 m. Pero los resultados numéricos obtenidos son distintos según el tipo de medio receptor, ya que en el medio estratificado la pluma queda atrapada a cierta profundidad, por lo que se obtienen menores diluciones en comparación con el escenario de medio receptor sin estratificar, en el que se obtienen diluciones más del doble (a una distancia de 20 m.) que en caso de escenario estratificado. A igualdad de parámetros, el modelo Visjet, calcula una dilución algo mayor.

Resumen de diluciones obtenidas :

|  |
|--|
| <b>EMISARIO D'EN BOSSA (SAN JOSEP DE SA TALAIA, IBIZA)</b> |
|--|

***diluciones a 20 m.***

| Casos         | Estratificado | Casos         | Sin Estratificar |
|---------------|---------------|---------------|------------------|
| Simulación 1  | 328           | Simulación 13 | 944              |
| Simulación 2  | 270           | Simulación 14 | 648              |
| Simulación 3  | 227           | Simulación 15 | 450              |
| Simulación 4  | 302           | Simulación 16 | 578              |
| Simulación 5  | 251           | Simulación 17 | 440              |
| Simulación 6  | 211           | Simulación 18 | 353              |
| Simulación 7  | 327           | Simulación 19 | 944              |
| Simulación 8  | 269           | Simulación 20 | 647              |
| Simulación 9  | 226           | Simulación 21 | 450              |
| Simulación 10 | 303           | Simulación 22 | 449              |
| Simulación 11 | 251           | Simulación 23 | 578              |
| Simulación 12 | 210           | Simulación 24 | 440              |

*Resumen de diluciones obtenidas con el modelo Visjet 2.0 :*



## EMISARIO D'EN BOSSA (SAN JOSEP DE SA TALAIA, IBIZA)

### Resumen de diluciones inicial (NFR)

#### Diluciones Modelo **Cormix**. Caso I Estratificado

Ángulo de corriente =90º

| Q (l/s) | Dilución inicial |          |
|---------|------------------|----------|
|         | Vc = 0.2         | Vc = 0.1 |
| 50      | 286              | 209      |
| 100     | 225              | 157      |
| 150     | 194              | 132      |

Ángulo de corriente =0º

| Q (l/s) | Dilución inicial |          |
|---------|------------------|----------|
|         | Vc = 0.2         | Vc = 0.1 |
| 50      | 277              | 192      |
| 100     | 215              | 142      |
| 150     | 184              | 118      |

#### Diluciones Modelo **Visjet**. Caso I Estratificado

Ángulo de corriente =90º

| Q (l/s) | Dilución inicial |          |
|---------|------------------|----------|
|         | Vc = 0.2         | Vc = 0.1 |
| 100     | 302              | 328      |
| 150     | 251              | 270      |
| 200     | 211              | 227      |

Ángulo de corriente =0º

| Q (l/s) | Dilución inicial |          |
|---------|------------------|----------|
|         | Vc = 0.2         | Vc = 0.1 |
| 100     | 303              | 327      |
| 150     | 251              | 269      |
| 200     | 210              | 226      |

Resumen de diluciones obtenidas con el modelo Cormix y Visjet 2.0 en medio estratificado

Las diluciones del modelo Visjet están tomadas a 20 m. que serían asemejables a la dilución inicial. En el modelo Cormix solo se han calculado en el escenario de medio receptor estratificado, ya que presenta inestabilidad en los resultados para el caso de medio sin estratificar. El modelo Visjet 2.0 presenta resultados estables y se han calculado las diluciones para los dos escenarios.

**Diluciones Modelo Visjet . Caso II Sin estratificar**

**Ángulo de corriente =90º**

| Q (l/s) | Dilución inicial |          |
|---------|------------------|----------|
|         | Vc = 0.2         | Vc = 0.1 |
| 100     | 578              | 944      |
| 150     | 440              | 648      |
| 200     | 353              | 450      |

**Ángulo de corriente =0º**

| Q (l/s) | Dilución inicial |          |
|---------|------------------|----------|
|         | Vc = 0.2         | Vc = 0.1 |
| 100     | 449              | 944      |
| 150     | 578              | 647      |
| 200     | 440              | 450      |

*Resumen de diluciones obtenidas con el modelo Visjet 2.0 en medio sin estratificar*

## **5. Resumen y conclusiones.**

1. Como ya se ha explicado y según se puede deducir de las tablas resumen y de los listados de las simulaciones, Para el caso de una corriente a 90º (que será el caso habitual), y para caudales de futuro cercano, es decir, 0.15 m³/s, con un medio estratificado y con la velocidad de corriente usual (0.10 m/s), las diluciones a 20 m de la salida del chorro están en el entorno de 250 en un medio estratificado. Esto significa que a 20 m. de la salida de los chorros, el efluente vertido se ha diluido en 249 partes
2. En el caso de tener el medio sin estratificación la dilución es de media 500 , Como se puede ver las diluciones del efluente a 20 m. de distancia son muy altas. Es necesario remarcar que estas diluciones son a 20 m. de distancia de la salida de los difusores, por lo cual a mayor distancia mejor será la dilución, aunque hay que precisar que para distancias mayores, las diluciones aumentan algo más lentamente, ver las gráficas de las simulaciones informáticas.

3. En el caso que se dieran caudales altos de futuro lejano ( $0.2 \text{ m}^3/\text{s}$ ) las diluciones son igualmente buenas, ya que estaríamos ante valores de dilución de 215 para el medio estratificado y de 400 para el medio no estratificado, siempre midiendo a 20 m. de la salida de los difusores.
4. Se tiene que todos los casos analizados tienen unas diluciones muy buenas siempre, mejorando bastante los valores de los límite legales, mejorando bastante los valores de los límite legales de dilución inicial de 80 para estratificado y de 100 para no estratificado.

## **6. Listado simulaciones Visjet**

# SIMULACIÓN 1

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 1 JETLAG 2000  
TITLE Jet1

## INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

## ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

## LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.83E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 1.8806 (m)       |
| ua       | ... | 0.1000 (m/s)  | lb    | ... | 2.8275 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 1.5337 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 79.9493          |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 90.00         | lQ/lM | ... | 0.0347           |
| Fd       | ... | 27.15         | lm/lb | ... | 0.6651           |
| Uj/ua    | ... | 35.37         | lM/lb | ... | 0.5424           |

Stratification case:

T ... -4784.49

| X                              | Y      | Z     | PLUME RADIUS | AVERAGE DILUTION | DENSITY DIFF. | VELOCITY |
|--------------------------------|--------|-------|--------------|------------------|---------------|----------|
| (m)                            | (m)    | (m)   | (m)          |                  | (sigmat)      | (m/s)    |
| 0.000                          | 0.000  | 0.000 | 0.030        | 1.00             | 29.6379       | 3.537    |
| 0.002                          | 0.179  | 0.000 | 0.059        | 1.94             | 7.5311        | 1.794    |
| 0.022                          | 0.543  | 0.003 | 0.116        | 3.84             | 3.7959        | 0.904    |
| 0.099                          | 1.112  | 0.022 | 0.230        | 7.64             | 1.9058        | 0.460    |
| 0.301                          | 1.804  | 0.086 | 0.443        | 15.23            | 0.9529        | 0.247    |
| 0.731                          | 2.509  | 0.242 | 0.794        | 30.39            | 0.4715        | 0.153    |
| 1.584                          | 3.194  | 0.567 | 1.271        | 60.66            | 0.2243        | 0.120    |
| 3.378                          | 3.906  | 1.242 | 1.877        | 121.08           | 0.0876        | 0.109    |
| 6.830                          | 4.591  | 2.349 | 2.720        | 241.79           | 0.0038        | 0.104    |
| NEUTRAL BUOYANCY LEVEL REACHED |        |       |              |                  |               |          |
| MAXIMUM RISE REACHED           |        |       |              |                  |               |          |
| 16.302                         | 5.508  | 3.277 | 3.769        | 447.49           | -0.0297       | 0.100    |
| TRAPPING LEVEL REACHED         |        |       |              |                  |               |          |
| 39.677                         | 6.786  | 2.910 | 5.157        | 836.50           | -0.0124       | 0.100    |
| 93.012                         | 8.416  | 2.626 | 6.791        | 1449.67          | 0.0022        | 0.100    |
| 212.051                        | 10.502 | 2.710 | 8.954        | 2518.98          | -0.0018       | 0.100    |
| 485.213                        | 13.260 | 2.737 | 11.815       | 4384.66          | -0.0031       | 0.100    |
| 1008.891                       | 16.340 | 2.655 | 15.767       | 7810.50          | 0.0009        | 0.100    |
| 1551.187                       | 18.178 | 2.745 | 20.707       | 13472.49         | -0.0035       | 0.100    |
| 1556.654                       | 18.191 | 2.631 | 20.777       | 13564.72         | 0.0021        | 0.100    |

NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 2.4248 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 251.8524 B = 2.78 M  
 MAXIMUM RISE (CENTER) = 3.3381 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 423.5699 B = 3.67 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 2 JETLAG 2000  
 TITLE Jet2

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^  

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0100 (m3/s) | Qj    | ... 1.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 3.54E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 2.83E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 3.5368 (m/s)  | lm    | ... 1.8806 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb    | ... 2.8275 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 1.5337 (m)       |
| po       | ... 0.99827(g/cc) | sm    | ... 35.3678          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 79.9493          |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0283           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0347           |
| Fd       | ... 27.15         | lm/lb | ... 0.6651           |
| Uj/Ua    | ... 35.37         | lM/lb | ... 0.5424           |

Stratification case:  
 T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 3.537    |
| -0.175                         | 0.000 | 0.000 | 0.060           | 1.95                | 7.5040                       | 1.738    |
| -0.529                         | 0.000 | 0.004 | 0.122           | 3.86                | 3.7784                       | 0.822    |
| -1.234                         | 0.000 | 0.037 | 0.259           | 7.65                | 1.9006                       | 0.365    |
| -2.584                         | 0.000 | 0.387 | 0.520           | 14.22               | 1.0084                       | 0.168    |
| -3.347                         | 0.000 | 1.169 | 1.032           | 28.46               | 0.4767                       | 0.085    |
| -3.280                         | 0.000 | 1.645 | 1.637           | 56.87               | 0.2221                       | 0.068    |
| -2.571                         | 0.000 | 2.208 | 2.108           | 110.90              | 0.0926                       | 0.079    |
| -0.180                         | 0.000 | 3.276 | 2.817           | 221.37              | 0.0076                       | 0.089    |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |          |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |          |
| 7.312                          | 0.000 | 4.365 | 3.690           | 388.95              | -0.0372                      | 0.091    |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |          |
| 26.632                         | 0.000 | 3.579 | 4.699           | 659.84              | 0.0014                       | 0.095    |
| 65.692                         | 0.000 | 3.807 | 5.916           | 1064.51             | -0.0083                      | 0.097    |
| 144.850                        | 0.000 | 3.796 | 7.497           | 1729.89             | -0.0080                      | 0.098    |

|          |       |       |        |         |        |       |
|----------|-------|-------|--------|---------|--------|-------|
| 304.709  | 0.000 | 3.526 | 9.401  | 2740.55 | 0.0054 | 0.099 |
| 640.783  | 0.000 | 3.607 | 11.937 | 4441.07 | 0.0014 | 0.099 |
| 1168.625 | 0.000 | 3.611 | 15.627 | 7637.62 | 0.0011 | 0.100 |
| 1173.879 | 0.000 | 3.551 | 15.670 | 7678.35 | 0.0040 | 0.100 |

NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 3.4239 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 240.2180 B = 2.93 M  
 MAXIMUM RISE (CENTER) = 4.3732 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 388.1041 B = 3.69 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 3 JETLAG 2000  
 TITLE Jet3

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^  

|         |          |       |       |        |        |
|---------|----------|-------|-------|--------|--------|
|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^  

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.83E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 2.8275 (m)       |
| dp/pa    | ... | 0.02883       | lm    | ... | 1.5337 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 79.9493          |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 0.00          | lQ/lm | ... | 0.0347           |
| Fd       | ... | 27.15         | lm/lb | ... | 0.6651           |
| Uj/Ua    | ... | 35.37         | lm/lb | ... | 0.5424           |

Coflowing case:  
 dmj ... 0.0344  
 lm\* ... 1.8539  
 Sm\* ... 34.3678

Stratification case:  
 T ... -4784.49

| X     | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|-------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)   | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000 | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 3.537             |
| 0.180 | 0.000 | 0.000 | 0.058           | 1.95                | 7.5026                       | 1.836             |
| 0.545 | 0.000 | 0.003 | 0.112           | 3.86                | 3.7763                       | 0.971             |
| 1.273 | 0.000 | 0.025 | 0.213           | 7.67                | 1.8976                       | 0.537             |
| 2.708 | 0.000 | 0.160 | 0.388           | 15.27               | 0.9473                       | 0.322             |
| 4.665 | 0.000 | 0.575 | 0.668           | 30.50               | 0.4588                       | 0.217             |

|                                |       |       |        |         |         |       |
|--------------------------------|-------|-------|--------|---------|---------|-------|
| 6.757                          | 0.000 | 1.239 | 1.089  | 60.99   | 0.2056  | 0.164 |
| 9.301                          | 0.000 | 2.115 | 1.700  | 121.90  | 0.0713  | 0.134 |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |        |         |         |       |
| 13.341                         | 0.000 | 3.261 | 2.576  | 243.33  | -0.0059 | 0.117 |
| MAXIMUM RISE REACHED           |       |       |        |         |         |       |
| 26.449                         | 0.000 | 3.716 | 3.458  | 409.73  | -0.0155 | 0.109 |
| TRAPPING LEVEL REACHED         |       |       |        |         |         |       |
| 50.614                         | 0.000 | 3.759 | 4.649  | 710.91  | -0.0201 | 0.105 |
| 98.742                         | 0.000 | 3.117 | 5.908  | 1129.47 | 0.0117  | 0.103 |
| 191.280                        | 0.000 | 3.289 | 7.527  | 1813.43 | 0.0032  | 0.102 |
| 373.736                        | 0.000 | 3.396 | 9.563  | 2906.35 | -0.0020 | 0.101 |
| 752.855                        | 0.000 | 3.419 | 12.259 | 4754.45 | -0.0031 | 0.101 |
| 1292.018                       | 0.000 | 3.382 | 16.102 | 8180.36 | -0.0013 | 0.100 |
| 1297.324                       | 0.000 | 3.442 | 16.145 | 8222.40 | -0.0042 | 0.100 |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.1379 M ABOVE DISCHARGE PORT

AVG DILUTION = 228.5233 B = 2.48 M

MAXIMUM RISE (CENTER) = 4.1516 M ABOVE DISCHARGE PORT

AVG DILUTION = 358.3134 B = 3.23 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

.....

CASE NO. 4 JETLAG 2000

TITLE Jet4

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |                        |
|----------------------------|------------------------|
| ENTRAINMENT HYPOTHESIS     | : ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : STANDARD             |
| TIME STEP CONTRL           | : VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : 1500                 |
| PRINTOUT INTERVAL          | : 100                  |
| MAX NUMBER OF ITERATIONS   | : 5                    |
| ITERATION ERROR BOUND      | : 0.00100              |
| APPROX RATIO OF MASS/DMASS | : 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0100 (m3/s) | Qj    | ... 1.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 3.54E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 2.83E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 3.5368 (m/s)  | lm    | ... 1.8806 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb    | ... 2.8275 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 1.5337 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 35.3678          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 79.9493          |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0283           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0347           |
| Fd       | ... 27.15         | lm/lb | ... 0.6651           |
| Uj/Ua    | ... 35.37         | lM/lb | ... 0.5424           |

Coflowing case:

|     |             |
|-----|-------------|
| dMj | ... 0.0344  |
| lm* | ... 1.8539  |
| Sm* | ... 34.3678 |

Stratification case:

|   |              |
|---|--------------|
| T | ... -4784.49 |
|---|--------------|



| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 3.537             |
| -0.175                         | 0.000    | 0.000    | 0.060                  | 1.95                | 7.5040                       | 1.738             |
| -0.529                         | 0.000    | 0.004    | 0.122                  | 3.86                | 3.7784                       | 0.822             |
| -1.234                         | 0.000    | 0.037    | 0.259                  | 7.65                | 1.9006                       | 0.365             |
| -2.584                         | 0.000    | 0.387    | 0.520                  | 14.22               | 1.0084                       | 0.168             |
| -3.347                         | 0.000    | 1.169    | 1.032                  | 28.46               | 0.4767                       | 0.085             |
| -3.280                         | 0.000    | 1.645    | 1.637                  | 56.87               | 0.2221                       | 0.068             |
| -2.571                         | 0.000    | 2.208    | 2.108                  | 110.90              | 0.0926                       | 0.079             |
| -0.180                         | 0.000    | 3.276    | 2.817                  | 221.37              | 0.0076                       | 0.089             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| 7.312                          | 0.000    | 4.365    | 3.690                  | 388.95              | -0.0372                      | 0.091             |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 26.632                         | 0.000    | 3.579    | 4.699                  | 659.84              | 0.0014                       | 0.095             |
| 65.692                         | 0.000    | 3.807    | 5.916                  | 1064.51             | -0.0083                      | 0.097             |
| 144.850                        | 0.000    | 3.796    | 7.497                  | 1729.89             | -0.0080                      | 0.098             |
| 304.709                        | 0.000    | 3.526    | 9.401                  | 2740.55             | 0.0054                       | 0.099             |
| 640.783                        | 0.000    | 3.607    | 11.937                 | 4441.07             | 0.0014                       | 0.099             |
| 1168.625                       | 0.000    | 3.611    | 15.627                 | 7637.62             | 0.0011                       | 0.100             |
| 1173.879                       | 0.000    | 3.551    | 15.670                 | 7678.35             | 0.0040                       | 0.100             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.4239 M ABOVE DISCHARGE PORT

AVG DILUTION = 240.2180 B = 2.93 M

MAXIMUM RISE (CENTER) = 4.3732 M ABOVE DISCHARGE PORT

AVG DILUTION = 388.1041 B = 3.69 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 5 JETLAG 2000

TITLE Jet5

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500

PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.83E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 2.8275 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 1.5337 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 79.9493          |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0347           |
| Fd       | ... | 27.15         | lm/lb | ... | 0.6651           |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 0.5424           |

Coflowing case:

dMj ... 0.0344  
lm\* ... 1.8539  
Sm\* ... 34.3678

Stratification case:

T ... -4784.49

| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 3.537             |
| 0.180                          | 0.000    | 0.000    | 0.058                  | 1.95                | 7.5026                       | 1.836             |
| 0.545                          | 0.000    | 0.003    | 0.112                  | 3.86                | 3.7763                       | 0.971             |
| 1.273                          | 0.000    | 0.025    | 0.213                  | 7.67                | 1.8976                       | 0.537             |
| 2.708                          | 0.000    | 0.160    | 0.388                  | 15.27               | 0.9473                       | 0.322             |
| 4.665                          | 0.000    | 0.575    | 0.668                  | 30.50               | 0.4588                       | 0.217             |
| 6.757                          | 0.000    | 1.239    | 1.089                  | 60.99               | 0.2056                       | 0.164             |
| 9.301                          | 0.000    | 2.115    | 1.700                  | 121.90              | 0.0713                       | 0.134             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| 13.341                         | 0.000    | 3.261    | 2.576                  | 243.33              | -0.0059                      | 0.117             |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| 26.449                         | 0.000    | 3.716    | 3.458                  | 409.73              | -0.0155                      | 0.109             |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 50.614                         | 0.000    | 3.759    | 4.649                  | 710.91              | -0.0201                      | 0.105             |
| 98.742                         | 0.000    | 3.117    | 5.908                  | 1129.47             | 0.0117                       | 0.103             |
| 191.280                        | 0.000    | 3.289    | 7.527                  | 1813.43             | 0.0032                       | 0.102             |
| 373.736                        | 0.000    | 3.396    | 9.563                  | 2906.35             | -0.0020                      | 0.101             |
| 752.855                        | 0.000    | 3.419    | 12.259                 | 4754.45             | -0.0031                      | 0.101             |
| 1292.018                       | 0.000    | 3.382    | 16.102                 | 8180.36             | -0.0013                      | 0.100             |
| 1297.324                       | 0.000    | 3.442    | 16.145                 | 8222.40             | -0.0042                      | 0.100             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.1379 M ABOVE DISCHARGE PORT

AVG DILUTION = 228.5233 B = 2.48 M

MAXIMUM RISE (CENTER) = 4.1516 M ABOVE DISCHARGE PORT

AVG DILUTION = 358.3134 B = 3.23 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 6 JETLAG 2000  
TITLE Jet6

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |    |     |                  |
|----------|-----|---------------|----|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj | ... | 2.83E-03 (m4/s3) |

|          |     |                |       |     |            |
|----------|-----|----------------|-------|-----|------------|
| Diameter | ... | 0.0600 (m)     | lQ    | ... | 0.0532 (m) |
| Uj       | ... | 3.5368 (m/s)   | lm    | ... | 1.8806 (m) |
| Ua       | ... | 0.1000 (m/s)   | lb    | ... | 2.8275 (m) |
| dp/pa    | ... | 0.02883        | lM    | ... | 1.5337 (m) |
| po       | ... | 0.99827 (g/cc) | Sm    | ... | 35.3678    |
| pa       | ... | 1.02790 (g/cc) | Sb    | ... | 79.9493    |
| Ver. ang | ... | 0.00           | lQ/lm | ... | 0.0283     |
| Hor. ang | ... | 180.00         | lQ/lM | ... | 0.0347     |
| Fd       | ... | 27.15          | lm/lb | ... | 0.6651     |
| Uj/Ua    | ... | 35.37          | lM/lb | ... | 0.5424     |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0344  |
| lm* | ... | 1.8539  |
| Sm* | ... | 34.3678 |

Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 3.537    |
| -0.175                         | 0.000 | 0.000 | 0.060           | 1.95                | 7.5040                       | 1.738    |
| -0.529                         | 0.000 | 0.004 | 0.122           | 3.86                | 3.7784                       | 0.822    |
| -1.234                         | 0.000 | 0.037 | 0.259           | 7.65                | 1.9006                       | 0.365    |
| -2.584                         | 0.000 | 0.387 | 0.520           | 14.22               | 1.0084                       | 0.168    |
| -3.347                         | 0.000 | 1.169 | 1.032           | 28.46               | 0.4767                       | 0.085    |
| -3.280                         | 0.000 | 1.645 | 1.637           | 56.87               | 0.2221                       | 0.068    |
| -2.571                         | 0.000 | 2.208 | 2.108           | 110.90              | 0.0926                       | 0.079    |
| -0.180                         | 0.000 | 3.276 | 2.817           | 221.37              | 0.0076                       | 0.089    |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |          |
| 7.312                          | 0.000 | 4.365 | 3.690           | 388.95              | -0.0372                      | 0.091    |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |          |
| 26.632                         | 0.000 | 3.579 | 4.699           | 659.84              | 0.0014                       | 0.095    |
| 65.692                         | 0.000 | 3.807 | 5.916           | 1064.51             | -0.0083                      | 0.097    |
| 144.850                        | 0.000 | 3.796 | 7.497           | 1729.89             | -0.0080                      | 0.098    |
| 304.709                        | 0.000 | 3.526 | 9.401           | 2740.55             | 0.0054                       | 0.099    |
| 640.783                        | 0.000 | 3.607 | 11.937          | 4441.07             | 0.0014                       | 0.099    |
| 1168.625                       | 0.000 | 3.611 | 15.627          | 7637.62             | 0.0011                       | 0.100    |
| 1173.879                       | 0.000 | 3.551 | 15.670          | 7678.35             | 0.0040                       | 0.100    |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.4239 M ABOVE DISCHARGE PORT

AVG DILUTION = 240.2180 B = 2.93 M

MAXIMUM RISE (CENTER) = 4.3732 M ABOVE DISCHARGE PORT

AVG DILUTION = 388.1041 B = 3.69 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 7 JETLAG 2000

TITLE Jet7

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |   |                      |
|----------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS     | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : | STANDARD             |
| TIME STEP CONTRL           | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : | 1500                 |
| PRINTOUT INTERVAL          | : | 100                  |
| MAX NUMBER OF ITERATIONS   | : | 5                    |
| ITERATION ERROR BOUND      | : | 0.00100              |
| APPROX RATIO OF MASS/DMASS | : | 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

# LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.83E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 2.8275 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 1.5337 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 79.9493          |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0347           |
| Fd       | ... | 27.15         | lm/lb | ... | 0.6651           |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 0.5424           |

## Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0344  |
| lm* | ... | 1.8539  |
| Sm* | ... | 34.3678 |

## Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

| X                              | Y     | Z     | PLUME RADIUS | AVERAGE DILUTION | DENSITY DIFF. (sigmat) | VELOCITY (m/s) |
|--------------------------------|-------|-------|--------------|------------------|------------------------|----------------|
| (m)                            | (m)   | (m)   | (m)          |                  |                        |                |
| 0.000                          | 0.000 | 0.000 | 0.030        | 1.00             | 29.6379                | 3.537          |
| 0.180                          | 0.000 | 0.000 | 0.058        | 1.95             | 7.5026                 | 1.836          |
| 0.545                          | 0.000 | 0.003 | 0.112        | 3.86             | 3.7763                 | 0.971          |
| 1.273                          | 0.000 | 0.025 | 0.213        | 7.67             | 1.8976                 | 0.537          |
| 2.708                          | 0.000 | 0.160 | 0.388        | 15.27            | 0.9473                 | 0.322          |
| 4.665                          | 0.000 | 0.575 | 0.668        | 30.50            | 0.4588                 | 0.217          |
| 6.757                          | 0.000 | 1.239 | 1.089        | 60.99            | 0.2056                 | 0.164          |
| 9.301                          | 0.000 | 2.115 | 1.700        | 121.90           | 0.0713                 | 0.134          |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |              |                  |                        |                |
| 13.341                         | 0.000 | 3.261 | 2.576        | 243.33           | -0.0059                | 0.117          |
| MAXIMUM RISE REACHED           |       |       |              |                  |                        |                |
| 26.449                         | 0.000 | 3.716 | 3.458        | 409.73           | -0.0155                | 0.109          |
| TRAPPING LEVEL REACHED         |       |       |              |                  |                        |                |
| 50.614                         | 0.000 | 3.759 | 4.649        | 710.91           | -0.0201                | 0.105          |
| 98.742                         | 0.000 | 3.117 | 5.908        | 1129.47          | 0.0117                 | 0.103          |
| 191.280                        | 0.000 | 3.289 | 7.527        | 1813.43          | 0.0032                 | 0.102          |
| 373.736                        | 0.000 | 3.396 | 9.563        | 2906.35          | -0.0020                | 0.101          |
| 752.855                        | 0.000 | 3.419 | 12.259       | 4754.45          | -0.0031                | 0.101          |
| 1292.018                       | 0.000 | 3.382 | 16.102       | 8180.36          | -0.0013                | 0.100          |
| 1297.324                       | 0.000 | 3.442 | 16.145       | 8222.40          | -0.0042                | 0.100          |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.1379 M ABOVE DISCHARGE PORT

AVG DILUTION = 228.5233 B = 2.48 M

MAXIMUM RISE (CENTER) = 4.1516 M ABOVE DISCHARGE PORT

AVG DILUTION = 358.3134 B = 3.23 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

..... JETLAG 2000

CASE NO. 8

TITLE Jet8

## INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC

SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)

COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

#### ENVIROMENTAL CONDITIONS

EXIT DEPTH(m) S T(C) SIGMAT U(m/s)  
 29.30 0.00 20.00 -1.73 3.537  
 AMBIENT 0.00 37.00 25.00 24.88 0.100  
 30.00 38.50 18.00 27.97 0.100

#### LENGTH & DILUTION SCALES

Total Q ... 0.0100 (m3/s) Qj ... 1.00E-02 (m3/s)  
 Port No. ... 1 Mj ... 3.54E-02 (m4/s2)  
 Depth ... 29.3000 (m) Bj ... 2.83E-03 (m4/s3)  
 Diameter ... 0.0600 (m) lQ ... 0.0532 (m)  
 Uj ... 3.5368 (m/s) lm ... 1.8806 (m)  
 Ua ... 0.1000 (m/s) lb ... 2.8275 (m)  
 dp/pa ... 0.02883 lM ... 1.5337 (m)  
 po ... 0.99827(g/cc) Sm ... 35.3678  
 pa ... 1.02790(g/cc) Sb ... 79.9493  
 Ver. ang ... 0.00 lQ/lm ... 0.0283  
 Hor. ang ... 180.00 lQ/lM ... 0.0347  
 Fd ... 27.15 lm/lb ... 0.6651  
 Uj/Ua ... 35.37 lM/lb ... 0.5424

#### Coflowing case:

dMj ... 0.0344  
 lm\* ... 1.8539  
 Sm\* ... 34.3678

#### Stratification case:

T ... -4784.49

| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 3.537             |
| -0.175                         | 0.000    | 0.000    | 0.060                  | 1.95                | 7.5040                       | 1.738             |
| -0.529                         | 0.000    | 0.004    | 0.122                  | 3.86                | 3.7784                       | 0.822             |
| -1.234                         | 0.000    | 0.037    | 0.259                  | 7.65                | 1.9006                       | 0.365             |
| -2.584                         | 0.000    | 0.387    | 0.520                  | 14.22               | 1.0084                       | 0.168             |
| -3.347                         | 0.000    | 1.169    | 1.032                  | 28.46               | 0.4767                       | 0.085             |
| -3.280                         | 0.000    | 1.645    | 1.637                  | 56.87               | 0.2221                       | 0.068             |
| -2.571                         | 0.000    | 2.208    | 2.108                  | 110.90              | 0.0926                       | 0.079             |
| -0.180                         | 0.000    | 3.276    | 2.817                  | 221.37              | 0.0076                       | 0.089             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| 7.312                          | 0.000    | 4.365    | 3.690                  | 388.95              | -0.0372                      | 0.091             |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 26.632                         | 0.000    | 3.579    | 4.699                  | 659.84              | 0.0014                       | 0.095             |
| 65.692                         | 0.000    | 3.807    | 5.916                  | 1064.51             | -0.0083                      | 0.097             |
| 144.850                        | 0.000    | 3.796    | 7.497                  | 1729.89             | -0.0080                      | 0.098             |
| 304.709                        | 0.000    | 3.526    | 9.401                  | 2740.55             | 0.0054                       | 0.099             |
| 640.783                        | 0.000    | 3.607    | 11.937                 | 4441.07             | 0.0014                       | 0.099             |
| 1168.625                       | 0.000    | 3.611    | 15.627                 | 7637.62             | 0.0011                       | 0.100             |
| 1173.879                       | 0.000    | 3.551    | 15.670                 | 7678.35             | 0.0040                       | 0.100             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.4239 M ABOVE DISCHARGE PORT

AVG DILUTION = 240.2180 B = 2.93 M

MAXIMUM RISE (CENTER) = 4.3732 M ABOVE DISCHARGE PORT

AVG DILUTION = 388.1041 B = 3.69 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 9 JETLAG 2000  
TITLE Jet9

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.83E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 1.8806 (m)       |
| ua       | ... | 0.1000 (m/s)  | lb    | ... | 2.8275 (m)       |
| dp/pa    | ... | 0.02883       | lm    | ... | 1.5337 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 79.9493          |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 0.00          | lQ/lm | ... | 0.0347           |
| Fd       | ... | 27.15         | lm/lb | ... | 0.6651           |
| Uj/ua    | ... | 35.37         | lm/lb | ... | 0.5424           |

Coflowing case:

dMj ... 0.0344  
lm\* ... 1.8539  
Sm\* ... 34.3678

Stratification case:

T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 3.537             |
| 0.180                          | 0.000 | 0.000 | 0.058           | 1.95                | 7.5026                       | 1.836             |
| 0.545                          | 0.000 | 0.003 | 0.112           | 3.86                | 3.7763                       | 0.971             |
| 1.273                          | 0.000 | 0.025 | 0.213           | 7.67                | 1.8976                       | 0.537             |
| 2.708                          | 0.000 | 0.160 | 0.388           | 15.27               | 0.9473                       | 0.322             |
| 4.665                          | 0.000 | 0.575 | 0.668           | 30.50               | 0.4588                       | 0.217             |
| 6.757                          | 0.000 | 1.239 | 1.089           | 60.99               | 0.2056                       | 0.164             |
| 9.301                          | 0.000 | 2.115 | 1.700           | 121.90              | 0.0713                       | 0.134             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| 13.341                         | 0.000 | 3.261 | 2.576           | 243.33              | -0.0059                      | 0.117             |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |                   |
| 26.449                         | 0.000 | 3.716 | 3.458           | 409.73              | -0.0155                      | 0.109             |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |                   |
| 50.614                         | 0.000 | 3.759 | 4.649           | 710.91              | -0.0201                      | 0.105             |
| 98.742                         | 0.000 | 3.117 | 5.908           | 1129.47             | 0.0117                       | 0.103             |
| 191.280                        | 0.000 | 3.289 | 7.527           | 1813.43             | 0.0032                       | 0.102             |
| 373.736                        | 0.000 | 3.396 | 9.563           | 2906.35             | -0.0020                      | 0.101             |
| 752.855                        | 0.000 | 3.419 | 12.259          | 4754.45             | -0.0031                      | 0.101             |

1292.018 0.000 3.382 16.102 8180.36 -0.0013 0.100  
1297.324 0.000 3.442 16.145 8222.40 -0.0042 0.100

NUMBER OF STEPS = 1500  
NEUTRAL BUOYANCY LEVEL = 3.1379 M ABOVE DISCHARGE PORT  
AVG DILUTION = 228.5233 B = 2.48 M  
MAXIMUM RISE (CENTER) = 4.1516 M ABOVE DISCHARGE PORT  
AVG DILUTION = 358.3134 B = 3.23 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)  
1  
ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
.....  
CASE NO. 10 JETLAG 2000  
TITLE Jet10

INPUT PARAMETERS  
^^^^^^^^^^^^^^^^^^^^  
ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
^^^^^^^^^^^^^^^^^^^^  
DEPTH(m) S T(C) SIGMAT U(m/s)  
EXIT 29.30 0.00 20.00 -1.73 3.537  
.....  
AMBIENT 0.00 37.00 25.00 24.88 0.100  
30.00 38.50 18.00 27.97 0.100

LENGTH & DILUTION SCALES  
^^^^^^^^^^^^^^^^^^^^  
Total Q ... 0.0100 (m3/s) Qj ... 1.00E-02 (m3/s)  
Port No. ... 1 Mj ... 3.54E-02 (m4/s2)  
Depth ... 29.3000 (m) Bj ... 2.83E-03 (m4/s3)  
Diameter ... 0.0600 (m) lQ ... 0.0532 (m)  
Uj ... 3.5368 (m/s) lm ... 1.8806 (m)  
Ua ... 0.1000 (m/s) lb ... 2.8275 (m)  
dp/pa ... 0.02883 lM ... 1.5337 (m)  
po ... 0.99827(g/cc) Sm ... 35.3678  
pa ... 1.02790(g/cc) Sb ... 79.9493  
Ver. ang ... 0.00 lQ/lm ... 0.0283  
Hor. ang ... 180.00 lQ/lM ... 0.0347  
Fd ... 27.15 lm/lb ... 0.6651  
Uj/Ua ... 35.37 lM/lb ... 0.5424

Coflowing case:  
dMj ... 0.0344  
lm\* ... 1.8539  
Sm\* ... 34.3678

Stratification case:  
T ... -4784.49

| X      | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)    | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000  | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 3.537    |
| -0.175 | 0.000 | 0.000 | 0.060           | 1.95                | 7.5040                       | 1.738    |
| -0.529 | 0.000 | 0.004 | 0.122           | 3.86                | 3.7784                       | 0.822    |
| -1.234 | 0.000 | 0.037 | 0.259           | 7.65                | 1.9006                       | 0.365    |
| -2.584 | 0.000 | 0.387 | 0.520           | 14.22               | 1.0084                       | 0.168    |
| -3.347 | 0.000 | 1.169 | 1.032           | 28.46               | 0.4767                       | 0.085    |
| -3.280 | 0.000 | 1.645 | 1.637           | 56.87               | 0.2221                       | 0.068    |
| -2.571 | 0.000 | 2.208 | 2.108           | 110.90              | 0.0926                       | 0.079    |

|                                |       |       |        |         |         |       |
|--------------------------------|-------|-------|--------|---------|---------|-------|
| -0.180                         | 0.000 | 3.276 | 2.817  | 221.37  | 0.0076  | 0.089 |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |        |         |         |       |
| MAXIMUM RISE REACHED           |       |       |        |         |         |       |
| 7.312                          | 0.000 | 4.365 | 3.690  | 388.95  | -0.0372 | 0.091 |
| TRAPPING LEVEL REACHED         |       |       |        |         |         |       |
| 26.632                         | 0.000 | 3.579 | 4.699  | 659.84  | 0.0014  | 0.095 |
| 65.692                         | 0.000 | 3.807 | 5.916  | 1064.51 | -0.0083 | 0.097 |
| 144.850                        | 0.000 | 3.796 | 7.497  | 1729.89 | -0.0080 | 0.098 |
| 304.709                        | 0.000 | 3.526 | 9.401  | 2740.55 | 0.0054  | 0.099 |
| 640.783                        | 0.000 | 3.607 | 11.937 | 4441.07 | 0.0014  | 0.099 |
| 1168.625                       | 0.000 | 3.611 | 15.627 | 7637.62 | 0.0011  | 0.100 |
| 1173.879                       | 0.000 | 3.551 | 15.670 | 7678.35 | 0.0040  | 0.100 |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.4239 M ABOVE DISCHARGE PORT

AVG DILUTION = 240.2180 B = 2.93 M

MAXIMUM RISE (CENTER) = 4.3732 M ABOVE DISCHARGE PORT

AVG DILUTION = 388.1041 B = 3.69 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

## SIMULACIÓN 2

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 1 JETLAG 2000  
TITLE Jet1

### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

### ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj    | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 4.24E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | lm    | ... 2.8209 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb    | ... 4.2413 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 2.3006 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 53.0516          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 119.9239         |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0188           |
| Hor. ang | ... 90.00         | lQ/lM | ... 0.0231           |
| Fd       | ... 40.73         | lm/lb | ... 0.6651           |
| Uj/Ua    | ... 53.05         | lM/lb | ... 0.5424           |

Stratification case:

T ... -4784.49

| X | Y | Z | PLUME | AVERAGE | DENSITY | VELOCITY |
|---|---|---|-------|---------|---------|----------|
|---|---|---|-------|---------|---------|----------|



| (m)                            | (m)    | (m)   | RADIUS<br>(m) | DILUTION | DIFF.<br>(sigmat) | (m/s) |
|--------------------------------|--------|-------|---------------|----------|-------------------|-------|
| 0.000                          | 0.000  | 0.000 | 0.030         | 1.00     | 29.6379           | 5.305 |
| 0.002                          | 0.178  | 0.000 | 0.059         | 1.95     | 7.5033            | 2.681 |
| 0.015                          | 0.547  | 0.002 | 0.116         | 3.84     | 3.7959            | 1.354 |
| 0.077                          | 1.224  | 0.012 | 0.231         | 7.63     | 1.9070            | 0.683 |
| 0.264                          | 2.177  | 0.061 | 0.453         | 15.21    | 0.9546            | 0.353 |
| 0.692                          | 3.231  | 0.204 | 0.855         | 30.36    | 0.4728            | 0.199 |
| 1.563                          | 4.282  | 0.525 | 1.463         | 60.62    | 0.2250            | 0.135 |
| 3.301                          | 5.315  | 1.165 | 2.254         | 121.00   | 0.0892            | 0.114 |
| 6.923                          | 6.391  | 2.319 | 3.310         | 241.56   | 0.0027            | 0.105 |
| NEUTRAL BUOYANCY LEVEL REACHED |        |       |               |          |                   |       |
| MAXIMUM RISE REACHED           |        |       |               |          |                   |       |
| 16.963                         | 7.841  | 3.200 | 4.671         | 460.06   | -0.0268           | 0.101 |
| TRAPPING LEVEL REACHED         |        |       |               |          |                   |       |
| 42.858                         | 9.876  | 2.976 | 6.454         | 872.96   | -0.0167           | 0.100 |
| 105.874                        | 12.563 | 2.749 | 8.686         | 1580.81  | -0.0051           | 0.100 |
| 256.630                        | 16.110 | 2.605 | 11.688        | 2861.46  | 0.0018            | 0.100 |
| 629.453                        | 20.939 | 2.581 | 15.822        | 5242.23  | 0.0029            | 0.100 |
| 1185.879                       | 25.068 | 2.554 | 21.197        | 9410.52  | 0.0043            | 0.100 |
| 1728.324                       | 27.355 | 2.486 | 27.928        | 16335.71 | 0.0076            | 0.100 |
| 1733.697                       | 27.372 | 2.538 | 27.973        | 16393.06 | 0.0051            | 0.100 |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.3737 M ABOVE DISCHARGE PORT

AVG DILUTION = 248.3345 B = 3.36 M

MAXIMUM RISE (CENTER) = 3.3050 M ABOVE DISCHARGE PORT

AVG DILUTION = 421.9290 B = 4.48 M

SURFACE LAYER (CENTER) LEVEL = 2.61 M ABOVE DISCHARGE PORT

AVG DILUTION = 14922.50

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 2 JETLAG 2000  
TITLE Jet2

#### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

#### ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

#### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj    | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 4.24E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | lm    | ... 2.8209 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb    | ... 4.2413 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 2.3006 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 53.0516          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 119.9239         |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0188           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0231           |
| Fd       | ... 40.73         | lm/lb | ... 0.6651           |

Uj/Ua ... 53.05

l<sub>m</sub>/l<sub>b</sub> ... 0.5424

Stratification case:  
T ... -4784.49

| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 5.305             |
| -0.176                         | 0.000    | 0.000    | 0.059                  | 1.95                | 7.5037                       | 2.631             |
| -0.531                         | 0.000    | 0.002    | 0.120                  | 3.86                | 3.7781                       | 1.270             |
| -1.242                         | 0.000    | 0.015    | 0.249                  | 7.66                | 1.8999                       | 0.588             |
| -2.637                         | 0.000    | 0.151    | 0.531                  | 15.02               | 0.9630                       | 0.254             |
| -4.701                         | 0.000    | 1.125    | 1.053                  | 28.36               | 0.4733                       | 0.122             |
| -5.140                         | 0.000    | 2.107    | 1.972                  | 56.68               | 0.2031                       | 0.070             |
| -4.742                         | 0.000    | 2.729    | 2.786                  | 113.23              | 0.0793                       | 0.070             |
| -2.721                         | 0.000    | 3.772    | 3.609                  | 222.70              | 0.0014                       | 0.082             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| 5.452                          | 0.000    | 4.698    | 4.538                  | 372.34              | -0.0337                      | 0.086             |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 25.727                         | 0.000    | 4.303    | 5.813                  | 652.87              | -0.0151                      | 0.092             |
| 68.962                         | 0.000    | 3.736    | 7.233                  | 1040.53             | 0.0137                       | 0.095             |
| 157.495                        | 0.000    | 3.898    | 8.985                  | 1637.23             | 0.0056                       | 0.097             |
| 338.707                        | 0.000    | 4.124    | 11.315                 | 2627.94             | -0.0056                      | 0.098             |
| 726.282                        | 0.000    | 4.011    | 14.469                 | 4332.40             | 0.0001                       | 0.099             |
| 1256.312                       | 0.000    | 3.910    | 18.993                 | 7502.29             | 0.0050                       | 0.099             |
| 1261.629                       | 0.000    | 3.942    | 19.026                 | 7529.86             | 0.0035                       | 0.099             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.8004 M ABOVE DISCHARGE PORT

AVG DILUTION = 225.9042 B = 3.63 M

MAXIMUM RISE (CENTER) = 4.8105 M ABOVE DISCHARGE PORT

AVG DILUTION = 363.5522 B = 4.50 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 3 JETLAG 2000  
TITLE Jet3

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |                |                      |
|----------|-------------------|----------------|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj             | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj             | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj             | ... 4.24E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | l <sub>Q</sub> | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | l <sub>m</sub> | ... 2.8209 (m)       |
| Ua       | ... 0.1000 (m/s)  | l <sub>b</sub> | ... 4.2413 (m)       |

```

dp/pa    ...    0.02883          lM ...    2.3006 (m)
po       ...    0.99827(g/cc)     Sm ...    53.0516
pa       ...    1.02790(g/cc)     Sb ...    119.9239
ver. ang ...    0.00             lQ/lm ...    0.0188
Hor. ang ...    0.00             lQ/lm ...    0.0231
Fd       ...    40.73             lm/lb ...    0.6651
Uj/Ua    ...    53.05             lM/lb ...    0.5424

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Coflowing case:

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dMj      ...    0.0781
lm*      ...    2.7942
sm*      ...    52.0516

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Stratification case:

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T        ... -4784.49

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| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 5.305             |
| 0.180                          | 0.000    | 0.000    | 0.058                  | 1.95                | 7.5028                       | 2.730             |
| 0.542                          | 0.000    | 0.001    | 0.114                  | 3.86                | 3.7767                       | 1.419             |
| 1.266                          | 0.000    | 0.012    | 0.219                  | 7.67                | 1.8984                       | 0.762             |
| 2.712                          | 0.000    | 0.082    | 0.410                  | 15.26               | 0.9506                       | 0.433             |
| 5.326                          | 0.000    | 0.438    | 0.732                  | 30.44               | 0.4630                       | 0.271             |
| 8.390                          | 0.000    | 1.224    | 1.232                  | 60.86               | 0.2030                       | 0.191             |
| 11.850                         | 0.000    | 2.335    | 1.977                  | 121.67              | 0.0615                       | 0.149             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| 17.261                         | 0.000    | 3.789    | 3.065                  | 242.67              | -0.0221                      | 0.123             |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 33.147                         | 0.000    | 3.454    | 4.126                  | 404.84              | 0.0076                       | 0.114             |
| 62.979                         | 0.000    | 3.630    | 5.413                  | 663.12              | -0.0034                      | 0.108             |
| 117.964                        | 0.000    | 3.815    | 7.001                  | 1074.99             | -0.0135                      | 0.105             |
| 223.663                        | 0.000    | 3.371    | 8.919                  | 1715.22             | 0.0084                       | 0.103             |
| 432.273                        | 0.000    | 3.437    | 11.350                 | 2747.60             | 0.0052                       | 0.102             |
| 861.830                        | 0.000    | 3.616    | 14.711                 | 4582.91             | -0.0037                      | 0.101             |
| 1402.316                       | 0.000    | 3.579    | 19.328                 | 7876.32             | -0.0018                      | 0.101             |
| 1407.629                       | 0.000    | 3.647    | 19.380                 | 7916.33             | -0.0052                      | 0.101             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.2955 M ABOVE DISCHARGE PORT

AVG DILUTION = 197.1617 B = 2.69 M

MAXIMUM RISE (CENTER) = 4.4650 M ABOVE DISCHARGE PORT

AVG DILUTION = 310.0082 B = 3.57 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

..... JETLAG 2000

CASE NO. 4

TITLE Jet4

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

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ENTRAINMENT HYPOTHESIS : ASYMMETRIC
SHEAR ENTRAINMENT      : VARIABLE (0 - 0.085)
COFLOW FACTOR          : STANDARD
TIME STEP CONTRL       : VARIABLE ( > 0.985 )
MAX NUMBER OF TIME STEPS : 1500
PRINTOUT INTERVAL      : 100
MAX NUMBER OF ITERATIONS : 5
ITERATION ERROR BOUND   : 0.00100
APPROX RATIO OF MASS/DMASS : 144.0

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ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |

30.00 38.50 18.00 27.97 0.100

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 4.24E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 2.8209 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 4.2413 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 2.3006 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 53.0516          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 119.9239         |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0188           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0231           |
| Fd       | ... | 40.73         | lm/lb | ... | 0.6651           |
| Uj/Ua    | ... | 53.05         | lM/lb | ... | 0.5424           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0781  |
| lm* | ... | 2.7942  |
| Sm* | ... | 52.0516 |

Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 5.305             |
| -0.176                         | 0.000 | 0.000 | 0.059           | 1.95                | 7.5037                       | 2.631             |
| -0.531                         | 0.000 | 0.002 | 0.120           | 3.86                | 3.7781                       | 1.270             |
| -1.242                         | 0.000 | 0.015 | 0.249           | 7.66                | 1.8999                       | 0.588             |
| -2.637                         | 0.000 | 0.151 | 0.531           | 15.02               | 0.9630                       | 0.254             |
| -4.701                         | 0.000 | 1.125 | 1.053           | 28.36               | 0.4733                       | 0.122             |
| -5.140                         | 0.000 | 2.107 | 1.972           | 56.68               | 0.2031                       | 0.070             |
| -4.742                         | 0.000 | 2.729 | 2.786           | 113.23              | 0.0793                       | 0.070             |
| -2.721                         | 0.000 | 3.772 | 3.609           | 222.70              | 0.0014                       | 0.082             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |                   |
| 5.452                          | 0.000 | 4.698 | 4.538           | 372.34              | -0.0337                      | 0.086             |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |                   |
| 25.727                         | 0.000 | 4.303 | 5.813           | 652.87              | -0.0151                      | 0.092             |
| 68.962                         | 0.000 | 3.736 | 7.233           | 1040.53             | 0.0137                       | 0.095             |
| 157.495                        | 0.000 | 3.898 | 8.985           | 1637.23             | 0.0056                       | 0.097             |
| 338.707                        | 0.000 | 4.124 | 11.315          | 2627.94             | -0.0056                      | 0.098             |
| 726.282                        | 0.000 | 4.011 | 14.469          | 4332.40             | 0.0001                       | 0.099             |
| 1256.312                       | 0.000 | 3.910 | 18.993          | 7502.29             | 0.0050                       | 0.099             |
| 1261.629                       | 0.000 | 3.942 | 19.026          | 7529.86             | 0.0035                       | 0.099             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.8004 M ABOVE DISCHARGE PORT

AVG DILUTION = 225.9042 B = 3.63 M

MAXIMUM RISE (CENTER) = 4.8105 M ABOVE DISCHARGE PORT

AVG DILUTION = 363.5522 B = 4.50 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

.....

CASE NO. 5 JETLAG 2000

TITLE Jet5

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                          |   |                      |
|--------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS   | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT        | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR            | : | STANDARD             |
| TIME STEP CONTRL         | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS | : | 1500                 |
| PRINTOUT INTERVAL        | : | 100                  |

MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

EXIT DEPTH(m) S T(C) SIGMAT U(m/s)  
 29.30 0.00 20.00 -1.73 5.305  
 .....  
 AMBIENT 0.00 37.00 25.00 24.88 0.100  
 30.00 38.50 18.00 27.97 0.100

LENGTH & DILUTION SCALES

Total Q ... 0.0150 (m3/s) Qj ... 1.50E-02 (m3/s)  
 Port No. ... 1 Mj ... 7.96E-02 (m4/s2)  
 Depth ... 29.3000 (m) Bj ... 4.24E-03 (m4/s3)  
 Diameter ... 0.0600 (m) lQ ... 0.0532 (m)  
 Uj ... 5.3052 (m/s) lm ... 2.8209 (m)  
 Ua ... 0.1000 (m/s) lb ... 4.2413 (m)  
 dp/pa ... 0.02883 lM ... 2.3006 (m)  
 po ... 0.99827(g/cc) Sm ... 53.0516  
 pa ... 1.02790(g/cc) Sb ... 119.9239  
 Ver. ang ... 0.00 lQ/lm ... 0.0188  
 Hor. ang ... 0.00 lQ/lM ... 0.0231  
 Fd ... 40.73 lm/lb ... 0.6651  
 Uj/Ua ... 53.05 lM/lb ... 0.5424

Coflowing case:

dMj ... 0.0781  
 lm\* ... 2.7942  
 Sm\* ... 52.0516

Stratification case:

T ... -4784.49

| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 5.305             |
| 0.180                          | 0.000    | 0.000    | 0.058                  | 1.95                | 7.5028                       | 2.730             |
| 0.542                          | 0.000    | 0.001    | 0.114                  | 3.86                | 3.7767                       | 1.419             |
| 1.266                          | 0.000    | 0.012    | 0.219                  | 7.67                | 1.8984                       | 0.762             |
| 2.712                          | 0.000    | 0.082    | 0.410                  | 15.26               | 0.9506                       | 0.433             |
| 5.326                          | 0.000    | 0.438    | 0.732                  | 30.44               | 0.4630                       | 0.271             |
| 8.390                          | 0.000    | 1.224    | 1.232                  | 60.86               | 0.2030                       | 0.191             |
| 11.850                         | 0.000    | 2.335    | 1.977                  | 121.67              | 0.0615                       | 0.149             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| 17.261                         | 0.000    | 3.789    | 3.065                  | 242.67              | -0.0221                      | 0.123             |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 33.147                         | 0.000    | 3.454    | 4.126                  | 404.84              | 0.0076                       | 0.114             |
| 62.979                         | 0.000    | 3.630    | 5.413                  | 663.12              | -0.0034                      | 0.108             |
| 117.964                        | 0.000    | 3.815    | 7.001                  | 1074.99             | -0.0135                      | 0.105             |
| 223.663                        | 0.000    | 3.371    | 8.919                  | 1715.22             | 0.0084                       | 0.103             |
| 432.273                        | 0.000    | 3.437    | 11.350                 | 2747.60             | 0.0052                       | 0.102             |
| 861.830                        | 0.000    | 3.616    | 14.711                 | 4582.91             | -0.0037                      | 0.101             |
| 1402.316                       | 0.000    | 3.579    | 19.328                 | 7876.32             | -0.0018                      | 0.101             |
| 1407.629                       | 0.000    | 3.647    | 19.380                 | 7916.33             | -0.0052                      | 0.101             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.2955 M ABOVE DISCHARGE PORT

AVG DILUTION = 197.1617 B = 2.69 M

MAXIMUM RISE (CENTER) = 4.4650 M ABOVE DISCHARGE PORT

AVG DILUTION = 310.0082 B = 3.57 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

.....

CASE NO. 6  
TITLE Jet6

JETLAG 2000

INPUT PARAMETERS  
^^^^^^^^^^^^^^^^^^^^

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES  
^^^^^^^^^^^^^^^^^^^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 4.24E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 2.8209 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 4.2413 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 2.3006 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 53.0516          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 119.9239         |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0188           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0231           |
| Fd       | ... | 40.73         | lm/lb | ... | 0.6651           |
| Uj/Ua    | ... | 53.05         | lM/lb | ... | 0.5424           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dmj | ... | 0.0781  |
| lm* | ... | 2.7942  |
| Sm* | ... | 52.0516 |

Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF. | VELOCITY |
|--------------------------------|-------|-------|-----------------|---------------------|------------------|----------|
| (m)                            | (m)   | (m)   | (m)             |                     | (sigmat)         | (m/s)    |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379          | 5.305    |
| -0.176                         | 0.000 | 0.000 | 0.059           | 1.95                | 7.5037           | 2.631    |
| -0.531                         | 0.000 | 0.002 | 0.120           | 3.86                | 3.7781           | 1.270    |
| -1.242                         | 0.000 | 0.015 | 0.249           | 7.66                | 1.8999           | 0.588    |
| -2.637                         | 0.000 | 0.151 | 0.531           | 15.02               | 0.9630           | 0.254    |
| -4.701                         | 0.000 | 1.125 | 1.053           | 28.36               | 0.4733           | 0.122    |
| -5.140                         | 0.000 | 2.107 | 1.972           | 56.68               | 0.2031           | 0.070    |
| -4.742                         | 0.000 | 2.729 | 2.786           | 113.23              | 0.0793           | 0.070    |
| -2.721                         | 0.000 | 3.772 | 3.609           | 222.70              | 0.0014           | 0.082    |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                  |          |
| 5.452                          | 0.000 | 4.698 | 4.538           | 372.34              | -0.0337          | 0.086    |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                  |          |
| 25.727                         | 0.000 | 4.303 | 5.813           | 652.87              | -0.0151          | 0.092    |
| 68.962                         | 0.000 | 3.736 | 7.233           | 1040.53             | 0.0137           | 0.095    |
| 157.495                        | 0.000 | 3.898 | 8.985           | 1637.23             | 0.0056           | 0.097    |
| 338.707                        | 0.000 | 4.124 | 11.315          | 2627.94             | -0.0056          | 0.098    |
| 726.282                        | 0.000 | 4.011 | 14.469          | 4332.40             | 0.0001           | 0.099    |
| 1256.312                       | 0.000 | 3.910 | 18.993          | 7502.29             | 0.0050           | 0.099    |
| 1261.629                       | 0.000 | 3.942 | 19.026          | 7529.86             | 0.0035           | 0.099    |

NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 3.8004 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 225.9042 B = 3.63 M  
 MAXIMUM RISE (CENTER) = 4.8105 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 363.5522 B = 4.50 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 7 JETLAG 2000  
 TITLE Jet7

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^^^^^

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^^^^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 4.24E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 2.8209 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 4.2413 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 2.3006 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 53.0516          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 119.9239         |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0188           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0231           |
| Fd       | ... | 40.73         | lm/lb | ... | 0.6651           |
| Uj/Ua    | ... | 53.05         | lM/lb | ... | 0.5424           |

Coflowing case:

dMj ... 0.0781  
 lm\* ... 2.7942  
 Sm\* ... 52.0516

Stratification case:

T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 5.305             |
| 0.180                          | 0.000 | 0.000 | 0.058           | 1.95                | 7.5028                       | 2.730             |
| 0.542                          | 0.000 | 0.001 | 0.114           | 3.86                | 3.7767                       | 1.419             |
| 1.266                          | 0.000 | 0.012 | 0.219           | 7.67                | 1.8984                       | 0.762             |
| 2.712                          | 0.000 | 0.082 | 0.410           | 15.26               | 0.9506                       | 0.433             |
| 5.326                          | 0.000 | 0.438 | 0.732           | 30.44               | 0.4630                       | 0.271             |
| 8.390                          | 0.000 | 1.224 | 1.232           | 60.86               | 0.2030                       | 0.191             |
| 11.850                         | 0.000 | 2.335 | 1.977           | 121.67              | 0.0615                       | 0.149             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| 17.261                         | 0.000 | 3.789 | 3.065           | 242.67              | -0.0221                      | 0.123             |

| MAXIMUM RISE REACHED   |       |       |        |         |         |       |  |
|------------------------|-------|-------|--------|---------|---------|-------|--|
| TRAPPING LEVEL REACHED |       |       |        |         |         |       |  |
| 33.147                 | 0.000 | 3.454 | 4.126  | 404.84  | 0.0076  | 0.114 |  |
| 62.979                 | 0.000 | 3.630 | 5.413  | 663.12  | -0.0034 | 0.108 |  |
| 117.964                | 0.000 | 3.815 | 7.001  | 1074.99 | -0.0135 | 0.105 |  |
| 223.663                | 0.000 | 3.371 | 8.919  | 1715.22 | 0.0084  | 0.103 |  |
| 432.273                | 0.000 | 3.437 | 11.350 | 2747.60 | 0.0052  | 0.102 |  |
| 861.830                | 0.000 | 3.616 | 14.711 | 4582.91 | -0.0037 | 0.101 |  |
| 1402.316               | 0.000 | 3.579 | 19.328 | 7876.32 | -0.0018 | 0.101 |  |
| 1407.629               | 0.000 | 3.647 | 19.380 | 7916.33 | -0.0052 | 0.101 |  |

NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 3.2955 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 197.1617 B = 2.69 M  
 MAXIMUM RISE (CENTER) = 4.4650 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 310.0082 B = 3.57 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)  
 1 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 8 JETLAG 2000  
 TITLE Jet8

INPUT PARAMETERS  
 ^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^  

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj    | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 4.24E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | lm    | ... 2.8209 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb    | ... 4.2413 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 2.3006 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 53.0516          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 119.9239         |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0188           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0231           |
| Fd       | ... 40.73         | lm/lb | ... 0.6651           |
| Uj/Ua    | ... 53.05         | lM/lb | ... 0.5424           |

Coflowing case:  
 dMj ... 0.0781  
 lm\* ... 2.7942  
 Sm\* ... 52.0516

Stratification case:  
 T ... -4784.49

| X     | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|-------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)   | (m)   | (m)   | (m)             |                     |                              |                   |
| ..... | ..... | ..... | .....           | .....               | .....                        | .....             |



|                                |       |       |        |         |         |       |
|--------------------------------|-------|-------|--------|---------|---------|-------|
| 0.000                          | 0.000 | 0.000 | 0.030  | 1.00    | 29.6379 | 5.305 |
| -0.176                         | 0.000 | 0.000 | 0.059  | 1.95    | 7.5037  | 2.631 |
| -0.531                         | 0.000 | 0.002 | 0.120  | 3.86    | 3.7781  | 1.270 |
| -1.242                         | 0.000 | 0.015 | 0.249  | 7.66    | 1.8999  | 0.588 |
| -2.637                         | 0.000 | 0.151 | 0.531  | 15.02   | 0.9630  | 0.254 |
| -4.701                         | 0.000 | 1.125 | 1.053  | 28.36   | 0.4733  | 0.122 |
| -5.140                         | 0.000 | 2.107 | 1.972  | 56.68   | 0.2031  | 0.070 |
| -4.742                         | 0.000 | 2.729 | 2.786  | 113.23  | 0.0793  | 0.070 |
| -2.721                         | 0.000 | 3.772 | 3.609  | 222.70  | 0.0014  | 0.082 |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |        |         |         |       |
| MAXIMUM RISE REACHED           |       |       |        |         |         |       |
| 5.452                          | 0.000 | 4.698 | 4.538  | 372.34  | -0.0337 | 0.086 |
| TRAPPING LEVEL REACHED         |       |       |        |         |         |       |
| 25.727                         | 0.000 | 4.303 | 5.813  | 652.87  | -0.0151 | 0.092 |
| 68.962                         | 0.000 | 3.736 | 7.233  | 1040.53 | 0.0137  | 0.095 |
| 157.495                        | 0.000 | 3.898 | 8.985  | 1637.23 | 0.0056  | 0.097 |
| 338.707                        | 0.000 | 4.124 | 11.315 | 2627.94 | -0.0056 | 0.098 |
| 726.282                        | 0.000 | 4.011 | 14.469 | 4332.40 | 0.0001  | 0.099 |
| 1256.312                       | 0.000 | 3.910 | 18.993 | 7502.29 | 0.0050  | 0.099 |
| 1261.629                       | 0.000 | 3.942 | 19.026 | 7529.86 | 0.0035  | 0.099 |

NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 3.8004 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 225.9042 B = 3.63 M  
 MAXIMUM RISE (CENTER) = 4.8105 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 363.5522 B = 4.50 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 9 JETLAG 2000  
 TITLE Jet9

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^  

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj    | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 4.24E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | lm    | ... 2.8209 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb    | ... 4.2413 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 2.3006 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 53.0516          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 119.9239         |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0188           |
| Hor. ang | ... 0.00          | lQ/lM | ... 0.0231           |
| Fd       | ... 40.73         | lm/lb | ... 0.6651           |
| Uj/Ua    | ... 53.05         | lM/lb | ... 0.5424           |

Coflowing case:  
 dmj ... 0.0781  
 lm\* ... 2.7942  
 Sm\* ... 52.0516

Stratification case:  
T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 5.305    |
| 0.180                          | 0.000 | 0.000 | 0.058           | 1.95                | 7.5028                       | 2.730    |
| 0.542                          | 0.000 | 0.001 | 0.114           | 3.86                | 3.7767                       | 1.419    |
| 1.266                          | 0.000 | 0.012 | 0.219           | 7.67                | 1.8984                       | 0.762    |
| 2.712                          | 0.000 | 0.082 | 0.410           | 15.26               | 0.9506                       | 0.433    |
| 5.326                          | 0.000 | 0.438 | 0.732           | 30.44               | 0.4630                       | 0.271    |
| 8.390                          | 0.000 | 1.224 | 1.232           | 60.86               | 0.2030                       | 0.191    |
| 11.850                         | 0.000 | 2.335 | 1.977           | 121.67              | 0.0615                       | 0.149    |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |          |
| 17.261                         | 0.000 | 3.789 | 3.065           | 242.67              | -0.0221                      | 0.123    |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |          |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |          |
| 33.147                         | 0.000 | 3.454 | 4.126           | 404.84              | 0.0076                       | 0.114    |
| 62.979                         | 0.000 | 3.630 | 5.413           | 663.12              | -0.0034                      | 0.108    |
| 117.964                        | 0.000 | 3.815 | 7.001           | 1074.99             | -0.0135                      | 0.105    |
| 223.663                        | 0.000 | 3.371 | 8.919           | 1715.22             | 0.0084                       | 0.103    |
| 432.273                        | 0.000 | 3.437 | 11.350          | 2747.60             | 0.0052                       | 0.102    |
| 861.830                        | 0.000 | 3.616 | 14.711          | 4582.91             | -0.0037                      | 0.101    |
| 1402.316                       | 0.000 | 3.579 | 19.328          | 7876.32             | -0.0018                      | 0.101    |
| 1407.629                       | 0.000 | 3.647 | 19.380          | 7916.33             | -0.0052                      | 0.101    |

NUMBER OF STEPS = 1500  
NEUTRAL BUOYANCY LEVEL = 3.2955 M ABOVE DISCHARGE PORT  
AVG DILUTION = 197.1617 B = 2.69 M  
MAXIMUM RISE (CENTER) = 4.4650 M ABOVE DISCHARGE PORT  
AVG DILUTION = 310.0082 B = 3.57 M

1 COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 10 JETLAG 2000  
TITLE Jet10

INPUT PARAMETERS  
AAAAAAAAAAAAAAAAAAAA  
ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
AAAAAAAAAAAAAAAAAAAA  
DEPTH(m) S T(C) SIGMAT U(m/s)  
EXIT 29.30 0.00 20.00 -1.73 5.305  
.....  
AMBIENT 0.00 37.00 25.00 24.88 0.100  
30.00 38.50 18.00 27.97 0.100

LENGTH & DILUTION SCALES  
AAAAAAAAAAAAAAAAAAAA  
Total Q ... 0.0150 (m3/s) Qj ... 1.50E-02 (m3/s)  
Port No. ... 1 Mj ... 7.96E-02 (m4/s2)  
Depth ... 29.3000 (m) Bj ... 4.24E-03 (m4/s3)  
Diameter ... 0.0600 (m) lQ ... 0.0532 (m)  
Uj ... 5.3052 (m/s) lm ... 2.8209 (m)  
Ua ... 0.1000 (m/s) lb ... 4.2413 (m)  
dp/pa ... 0.02883 lM ... 2.3006 (m)  
po ... 0.99827(g/cc) Sm ... 53.0516

pa ... 1.02790(g/cc)                      Sb ... 119.9239  
 Ver. ang ... 0.00                      lQ/lm ... 0.0188  
 Hor. ang ... 180.00                      lQ/lM ... 0.0231  
 Fd ... 40.73                      lm/lb ... 0.6651  
 Uj/Ua ... 53.05                      lM/lb ... 0.5424

Coflowing case:  
 dMj ... 0.0781  
 lm\* ... 2.7942  
 sm\* ... 52.0516

Stratification case:  
 T ... -4784.49

| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 5.305             |
| -0.176                         | 0.000    | 0.000    | 0.059                  | 1.95                | 7.5037                       | 2.631             |
| -0.531                         | 0.000    | 0.002    | 0.120                  | 3.86                | 3.7781                       | 1.270             |
| -1.242                         | 0.000    | 0.015    | 0.249                  | 7.66                | 1.8999                       | 0.588             |
| -2.637                         | 0.000    | 0.151    | 0.531                  | 15.02               | 0.9630                       | 0.254             |
| -4.701                         | 0.000    | 1.125    | 1.053                  | 28.36               | 0.4733                       | 0.122             |
| -5.140                         | 0.000    | 2.107    | 1.972                  | 56.68               | 0.2031                       | 0.070             |
| -4.742                         | 0.000    | 2.729    | 2.786                  | 113.23              | 0.0793                       | 0.070             |
| -2.721                         | 0.000    | 3.772    | 3.609                  | 222.70              | 0.0014                       | 0.082             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| 5.452                          | 0.000    | 4.698    | 4.538                  | 372.34              | -0.0337                      | 0.086             |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 25.727                         | 0.000    | 4.303    | 5.813                  | 652.87              | -0.0151                      | 0.092             |
| 68.962                         | 0.000    | 3.736    | 7.233                  | 1040.53             | 0.0137                       | 0.095             |
| 157.495                        | 0.000    | 3.898    | 8.985                  | 1637.23             | 0.0056                       | 0.097             |
| 338.707                        | 0.000    | 4.124    | 11.315                 | 2627.94             | -0.0056                      | 0.098             |
| 726.282                        | 0.000    | 4.011    | 14.469                 | 4332.40             | 0.0001                       | 0.099             |
| 1256.312                       | 0.000    | 3.910    | 18.993                 | 7502.29             | 0.0050                       | 0.099             |
| 1261.629                       | 0.000    | 3.942    | 19.026                 | 7529.86             | 0.0035                       | 0.099             |

NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 3.8004 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 225.9042 B = 3.63 M  
 MAXIMUM RISE (CENTER) = 4.8105 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 363.5522 B = 4.50 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

### **SIMULACIÓN 3**

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 1 JETLAG 2000  
 TITLE Jet1

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

# LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.66E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 3.7613 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 5.6551 (m)       |
| dp/pa    | ... | 0.02883       | lm    | ... | 3.0675 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 70.7355          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 159.8985         |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0141           |
| Hor. ang | ... | 90.00         | lQ/lm | ... | 0.0173           |
| Fd       | ... | 54.31         | lm/lb | ... | 0.6651           |
| Uj/Ua    | ... | 70.74         | lm/lb | ... | 0.5424           |

Stratification case:  
T ... -4784.49

| X                              | Y      | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|--------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)    | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000  | 0.000 | 0.030           | 1.00                | 29.6379                      | 7.074             |
| 0.001                          | 0.178  | 0.000 | 0.059           | 1.95                | 7.5033                       | 3.574             |
| 0.011                          | 0.538  | 0.001 | 0.117           | 3.85                | 3.7904                       | 1.801             |
| 0.061                          | 1.266  | 0.008 | 0.231           | 7.63                | 1.9080                       | 0.908             |
| 0.229                          | 2.400  | 0.044 | 0.457           | 15.20               | 0.9559                       | 0.463             |
| 0.651                          | 3.782  | 0.172 | 0.881           | 30.33               | 0.4741                       | 0.249             |
| 1.526                          | 5.189  | 0.482 | 1.580           | 60.57               | 0.2260                       | 0.154             |
| 3.243                          | 6.559  | 1.105 | 2.537           | 120.94              | 0.0904                       | 0.120             |
| 6.827                          | 7.974  | 2.234 | 3.791           | 241.38              | 0.0041                       | 0.107             |
| NEUTRAL BUOYANCY LEVEL REACHED |        |       |                 |                     |                              |                   |
| 16.641                         | 9.859  | 3.159 | 5.436           | 469.17              | -0.0274                      | 0.101             |
| MAXIMUM RISE REACHED           |        |       |                 |                     |                              |                   |
| 43.431                         | 12.588 | 2.917 | 7.582           | 904.56              | -0.0162                      | 0.100             |
| 111.489                        | 16.256 | 2.492 | 10.379          | 1693.45             | 0.0051                       | 0.100             |
| 282.776                        | 21.206 | 2.632 | 14.137          | 3139.69             | -0.0020                      | 0.100             |
| 715.152                        | 27.913 | 2.670 | 19.418          | 5921.99             | -0.0038                      | 0.100             |
| 1272.314                       | 32.796 | 2.654 | 25.968          | 10595.58            | -0.0032                      | 0.100             |
| 1813.458                       | 35.489 | 2.783 | 34.103          | 18267.98            | -0.0094                      | 0.100             |
| 1818.815                       | 35.509 | 2.690 | 34.140          | 18318.46            | -0.0050                      | 0.100             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.3158 M ABOVE DISCHARGE PORT

AVG DILUTION = 251.4447 B = 3.88 M

MAXIMUM RISE (CENTER) = 3.2374 M ABOVE DISCHARGE PORT

AVG DILUTION = 431.7774 B = 5.22 M

SURFACE LAYER (CENTER) LEVEL = 2.63 M ABOVE DISCHARGE PORT

AVG DILUTION = 11177.29

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

.....  
CASE NO. 2 JETLAG 2000

TITLE Jet2

## INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAAAAAAAAAA

|                          |   |                      |
|--------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS   | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT        | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR            | : | STANDARD             |
| TIME STEP CONTRL         | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS | : | 1500                 |

PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|          |     |                |       |     |                  |
|----------|-----|----------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s)  | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1              | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)    | Bj    | ... | 5.66E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)     | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)   | lm    | ... | 3.7613 (m)       |
| Ua       | ... | 0.1000 (m/s)   | lb    | ... | 5.6551 (m)       |
| dp/pa    | ... | 0.02883        | lm    | ... | 3.0675 (m)       |
| po       | ... | 0.99827 (g/cc) | sm    | ... | 70.7355          |
| pa       | ... | 1.02790 (g/cc) | Sb    | ... | 159.8985         |
| Ver. ang | ... | 0.00           | lQ/lm | ... | 0.0141           |
| Hor. ang | ... | 180.00         | lQ/lm | ... | 0.0173           |
| Fd       | ... | 54.31          | lm/lb | ... | 0.6651           |
| Uj/Ua    | ... | 70.74          | lm/lb | ... | 0.5424           |

Stratification case:  
 T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 7.074             |
| -0.177                         | 0.000 | 0.000 | 0.059           | 1.95                | 7.5036                       | 3.524             |
| -0.533                         | 0.000 | 0.001 | 0.120           | 3.86                | 3.7780                       | 1.719             |
| -1.244                         | 0.000 | 0.008 | 0.245           | 7.66                | 1.9000                       | 0.813             |
| -2.661                         | 0.000 | 0.079 | 0.519           | 15.23               | 0.9527                       | 0.360             |
| -5.364                         | 0.000 | 0.800 | 1.043           | 28.31               | 0.4832                       | 0.166             |
| -6.894                         | 0.000 | 2.383 | 2.109           | 56.69               | 0.1863                       | 0.081             |
| -6.752                         | 0.000 | 3.269 | 3.394           | 113.19              | 0.0627                       | 0.063             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| -5.232                         | 0.000 | 4.227 | 4.370           | 223.48              | -0.0039                      | 0.075             |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |                   |
| 2.870                          | 0.000 | 4.974 | 5.322           | 363.56              | -0.0293                      | 0.082             |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |                   |
| 23.346                         | 0.000 | 4.797 | 6.712           | 629.90              | -0.0219                      | 0.089             |
| 68.397                         | 0.000 | 4.184 | 8.193           | 981.13              | 0.0085                       | 0.093             |
| 161.483                        | 0.000 | 4.538 | 10.226          | 1569.87             | -0.0089                      | 0.096             |
| 354.766                        | 0.000 | 4.436 | 12.829          | 2514.10             | -0.0038                      | 0.097             |
| 766.404                        | 0.000 | 4.277 | 16.438          | 4173.70             | 0.0040                       | 0.098             |
| 1294.827                       | 0.000 | 4.419 | 21.239          | 7017.20             | -0.0030                      | 0.099             |
| 1300.218                       | 0.000 | 4.300 | 21.314          | 7067.07             | 0.0029                       | 0.099             |

NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 4.1453 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 214.1874 B = 4.30 M  
 MAXIMUM RISE (CENTER) = 5.1972 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 350.5213 B = 5.28 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 3 JETLAG 2000  
 TITLE Jet3

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.66E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 3.7613 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 5.6551 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 3.0675 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 70.7355          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 159.8985         |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0141           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0173           |
| Fd       | ... | 54.31         | lm/lb | ... | 0.6651           |
| Uj/Ua    | ... | 70.74         | lM/lb | ... | 0.5424           |

Coflowing case:

dMj ... 0.1395  
lm\* ... 3.7346  
Sm\* ... 69.7355

Stratification case:

T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 7.074    |
| 0.179                          | 0.000 | 0.000 | 0.059           | 1.95                | 7.5029                       | 3.623    |
| 0.540                          | 0.000 | 0.001 | 0.115           | 3.86                | 3.7769                       | 1.867    |
| 1.263                          | 0.000 | 0.007 | 0.222           | 7.67                | 1.8988                       | 0.987    |
| 2.706                          | 0.000 | 0.049 | 0.422           | 15.26               | 0.9519                       | 0.545    |
| 5.554                          | 0.000 | 0.310 | 0.770           | 30.40               | 0.4675                       | 0.326    |
| 9.533                          | 0.000 | 1.124 | 1.330           | 60.76               | 0.2040                       | 0.219    |
| 13.998                         | 0.000 | 2.428 | 2.180           | 121.48              | 0.0549                       | 0.163    |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |          |
| 20.867                         | 0.000 | 4.133 | 3.443           | 241.80              | -0.0345                      | 0.130    |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |          |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |          |
| 39.733                         | 0.000 | 3.129 | 4.748           | 413.65              | 0.0263                       | 0.117    |
| 75.181                         | 0.000 | 3.196 | 6.222           | 669.63              | 0.0214                       | 0.110    |
| 139.872                        | 0.000 | 3.357 | 7.974           | 1062.66             | 0.0134                       | 0.106    |
| 261.688                        | 0.000 | 3.456 | 10.187          | 1695.21             | 0.0085                       | 0.104    |
| 502.440                        | 0.000 | 3.533 | 13.015          | 2727.21             | 0.0047                       | 0.102    |
| 977.871                        | 0.000 | 3.622 | 17.029          | 4622.62             | 0.0003                       | 0.101    |
| 1519.698                       | 0.000 | 3.753 | 22.283          | 7866.81             | -0.0061                      | 0.101    |
| 1525.097                       | 0.000 | 3.701 | 22.318          | 7892.87             | -0.0037                      | 0.101    |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.3322 M ABOVE DISCHARGE PORT

AVG DILUTION = 179.3414 B = 2.83 M

MAXIMUM RISE (CENTER) = 4.6136 M ABOVE DISCHARGE PORT

AVG DILUTION = 289.8933 B = 3.87 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 4 JETLAG 2000  
TITLE Jet4

INPUT PARAMETERS  
^^^^^^^^^^^^^^^^^^^^

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES  
^^^^^^^^^^^^^^^^^^^^

|          |                    |       |                      |
|----------|--------------------|-------|----------------------|
| Total Q  | ... 0.0200 (m3/s)  | Qj    | ... 2.00E-02 (m3/s)  |
| Port No. | ... 1              | Mj    | ... 1.41E-01 (m4/s2) |
| Depth    | ... 29.3000 (m)    | Bj    | ... 5.66E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)     | lQ    | ... 0.0532 (m)       |
| Uj       | ... 7.0736 (m/s)   | lm    | ... 3.7613 (m)       |
| Ua       | ... 0.1000 (m/s)   | lb    | ... 5.6551 (m)       |
| dp/pa    | ... 0.02883        | lM    | ... 3.0675 (m)       |
| po       | ... 0.99827 (g/cc) | Sm    | ... 70.7355          |
| pa       | ... 1.02790 (g/cc) | Sb    | ... 159.8985         |
| Ver. ang | ... 0.00           | lQ/lm | ... 0.0141           |
| Hor. ang | ... 180.00         | lQ/lM | ... 0.0173           |
| Fd       | ... 54.31          | lm/lb | ... 0.6651           |
| Uj/Ua    | ... 70.74          | lM/lb | ... 0.5424           |

Coflowing case:

dMj ... 0.1395  
lm\* ... 3.7346  
Sm\* ... 69.7355

Stratification case:

T ... -4784.49

| X                              | Y     | Z     | PLUME RADIUS | AVERAGE DILUTION | DENSITY DIFF. (sigmat) | VELOCITY |
|--------------------------------|-------|-------|--------------|------------------|------------------------|----------|
| (m)                            | (m)   | (m)   | (m)          |                  |                        | (m/s)    |
| 0.000                          | 0.000 | 0.000 | 0.030        | 1.00             | 29.6379                | 7.074    |
| -0.177                         | 0.000 | 0.000 | 0.059        | 1.95             | 7.5036                 | 3.524    |
| -0.533                         | 0.000 | 0.001 | 0.120        | 3.86             | 3.7780                 | 1.719    |
| -1.244                         | 0.000 | 0.008 | 0.245        | 7.66             | 1.9000                 | 0.813    |
| -2.661                         | 0.000 | 0.079 | 0.519        | 15.23            | 0.9527                 | 0.360    |
| -5.364                         | 0.000 | 0.800 | 1.043        | 28.31            | 0.4832                 | 0.166    |
| -6.894                         | 0.000 | 2.383 | 2.109        | 56.69            | 0.1863                 | 0.081    |
| -6.752                         | 0.000 | 3.269 | 3.394        | 113.19           | 0.0627                 | 0.063    |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |              |                  |                        |          |
| -5.232                         | 0.000 | 4.227 | 4.370        | 223.48           | -0.0039                | 0.075    |
| MAXIMUM RISE REACHED           |       |       |              |                  |                        |          |
| 2.870                          | 0.000 | 4.974 | 5.322        | 363.56           | -0.0293                | 0.082    |
| TRAPPING LEVEL REACHED         |       |       |              |                  |                        |          |
| 23.346                         | 0.000 | 4.797 | 6.712        | 629.90           | -0.0219                | 0.089    |
| 68.397                         | 0.000 | 4.184 | 8.193        | 981.13           | 0.0085                 | 0.093    |

|          |       |       |        |         |         |       |
|----------|-------|-------|--------|---------|---------|-------|
| 161.483  | 0.000 | 4.538 | 10.226 | 1569.87 | -0.0089 | 0.096 |
| 354.766  | 0.000 | 4.436 | 12.829 | 2514.10 | -0.0038 | 0.097 |
| 766.404  | 0.000 | 4.277 | 16.438 | 4173.70 | 0.0040  | 0.098 |
| 1294.827 | 0.000 | 4.419 | 21.239 | 7017.20 | -0.0030 | 0.099 |
| 1300.218 | 0.000 | 4.300 | 21.314 | 7067.07 | 0.0029  | 0.099 |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 4.1453 M ABOVE DISCHARGE PORT

AVG DILUTION = 214.1874 B = 4.30 M

MAXIMUM RISE (CENTER) = 5.1972 M ABOVE DISCHARGE PORT

AVG DILUTION = 350.5213 B = 5.28 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 5 JETLAG 2000

TITLE Jet5

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |   |                      |
|----------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS     | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : | STANDARD             |
| TIME STEP CONTRL           | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : | 1500                 |
| PRINTOUT INTERVAL          | : | 100                  |
| MAX NUMBER OF ITERATIONS   | : | 5                    |
| ITERATION ERROR BOUND      | : | 0.00100              |
| APPROX RATIO OF MASS/DMASS | : | 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         |          |       |       |        |        |
|---------|----------|-------|-------|--------|--------|
|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.66E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 3.7613 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 5.6551 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 3.0675 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 70.7355          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 159.8985         |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0141           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0173           |
| Fd       | ... | 54.31         | lm/lb | ... | 0.6651           |
| Uj/Ua    | ... | 70.74         | lM/lb | ... | 0.5424           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.1395  |
| lm* | ... | 3.7346  |
| Sm* | ... | 69.7355 |

Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

|       |       |       |                 |                     |                              |          |
|-------|-------|-------|-----------------|---------------------|------------------------------|----------|
| X     | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
| (m)   | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| ..... | ..... | ..... | .....           | .....               | .....                        | .....    |
| 0.000 | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 7.074    |
| 0.179 | 0.000 | 0.000 | 0.059           | 1.95                | 7.5029                       | 3.623    |
| 0.540 | 0.000 | 0.001 | 0.115           | 3.86                | 3.7769                       | 1.867    |
| 1.263 | 0.000 | 0.007 | 0.222           | 7.67                | 1.8988                       | 0.987    |
| 2.706 | 0.000 | 0.049 | 0.422           | 15.26               | 0.9519                       | 0.545    |



|                                |       |       |        |         |         |       |
|--------------------------------|-------|-------|--------|---------|---------|-------|
| 5.554                          | 0.000 | 0.310 | 0.770  | 30.40   | 0.4675  | 0.326 |
| 9.533                          | 0.000 | 1.124 | 1.330  | 60.76   | 0.2040  | 0.219 |
| 13.998                         | 0.000 | 2.428 | 2.180  | 121.48  | 0.0549  | 0.163 |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |        |         |         |       |
| 20.867                         | 0.000 | 4.133 | 3.443  | 241.80  | -0.0345 | 0.130 |
| MAXIMUM RISE REACHED           |       |       |        |         |         |       |
| TRAPPING LEVEL REACHED         |       |       |        |         |         |       |
| 39.733                         | 0.000 | 3.129 | 4.748  | 413.65  | 0.0263  | 0.117 |
| 75.181                         | 0.000 | 3.196 | 6.222  | 669.63  | 0.0214  | 0.110 |
| 139.872                        | 0.000 | 3.357 | 7.974  | 1062.66 | 0.0134  | 0.106 |
| 261.688                        | 0.000 | 3.456 | 10.187 | 1695.21 | 0.0085  | 0.104 |
| 502.440                        | 0.000 | 3.533 | 13.015 | 2727.21 | 0.0047  | 0.102 |
| 977.871                        | 0.000 | 3.622 | 17.029 | 4622.62 | 0.0003  | 0.101 |
| 1519.698                       | 0.000 | 3.753 | 22.283 | 7866.81 | -0.0061 | 0.101 |
| 1525.097                       | 0.000 | 3.701 | 22.318 | 7892.87 | -0.0037 | 0.101 |

NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 3.3322 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 179.3414 B = 2.83 M  
 MAXIMUM RISE (CENTER) = 4.6136 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 289.8933 B = 3.87 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 6 JETLAG 2000  
 TITLE Jet6

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^  

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0200 (m3/s) | Qj    | ... 2.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 1.41E-01 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 5.66E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 7.0736 (m/s)  | lm    | ... 3.7613 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb    | ... 5.6551 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 3.0675 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 70.7355          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 159.8985         |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0141           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0173           |
| Fd       | ... 54.31         | lm/lb | ... 0.6651           |
| Uj/Ua    | ... 70.74         | lM/lb | ... 0.5424           |

Coflowing case:  
 dmj ... 0.1395  
 lm\* ... 3.7346  
 Sm\* ... 69.7355

Stratification case:  
 T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 7.074    |
| -0.177                         | 0.000 | 0.000 | 0.059           | 1.95                | 7.5036                       | 3.524    |
| -0.533                         | 0.000 | 0.001 | 0.120           | 3.86                | 3.7780                       | 1.719    |
| -1.244                         | 0.000 | 0.008 | 0.245           | 7.66                | 1.9000                       | 0.813    |
| -2.661                         | 0.000 | 0.079 | 0.519           | 15.23               | 0.9527                       | 0.360    |
| -5.364                         | 0.000 | 0.800 | 1.043           | 28.31               | 0.4832                       | 0.166    |
| -6.894                         | 0.000 | 2.383 | 2.109           | 56.69               | 0.1863                       | 0.081    |
| -6.752                         | 0.000 | 3.269 | 3.394           | 113.19              | 0.0627                       | 0.063    |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |          |
| -5.232                         | 0.000 | 4.227 | 4.370           | 223.48              | -0.0039                      | 0.075    |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |          |
| 2.870                          | 0.000 | 4.974 | 5.322           | 363.56              | -0.0293                      | 0.082    |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |          |
| 23.346                         | 0.000 | 4.797 | 6.712           | 629.90              | -0.0219                      | 0.089    |
| 68.397                         | 0.000 | 4.184 | 8.193           | 981.13              | 0.0085                       | 0.093    |
| 161.483                        | 0.000 | 4.538 | 10.226          | 1569.87             | -0.0089                      | 0.096    |
| 354.766                        | 0.000 | 4.436 | 12.829          | 2514.10             | -0.0038                      | 0.097    |
| 766.404                        | 0.000 | 4.277 | 16.438          | 4173.70             | 0.0040                       | 0.098    |
| 1294.827                       | 0.000 | 4.419 | 21.239          | 7017.20             | -0.0030                      | 0.099    |
| 1300.218                       | 0.000 | 4.300 | 21.314          | 7067.07             | 0.0029                       | 0.099    |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 4.1453 M ABOVE DISCHARGE PORT

AVG DILUTION = 214.1874 B = 4.30 M

MAXIMUM RISE (CENTER) = 5.1972 M ABOVE DISCHARGE PORT

AVG DILUTION = 350.5213 B = 5.28 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 7 JETLAG 2000  
TITLE Jet7

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0200 (m3/s) | Qj    | ... 2.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 1.41E-01 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 5.66E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 7.0736 (m/s)  | lm    | ... 3.7613 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb    | ... 5.6551 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 3.0675 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 70.7355          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 159.8985         |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0141           |
| Hor. ang | ... 0.00          | lQ/lM | ... 0.0173           |
| Fd       | ... 54.31         | lm/lb | ... 0.6651           |

uj/ua ... 70.74

lm/lb ... 0.5424

Coflowing case:

dmj ... 0.1395

lm\* ... 3.7346

sm\* ... 69.7355

Stratification case:

T ... -4784.49

| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 7.074             |
| 0.179                          | 0.000    | 0.000    | 0.059                  | 1.95                | 7.5029                       | 3.623             |
| 0.540                          | 0.000    | 0.001    | 0.115                  | 3.86                | 3.7769                       | 1.867             |
| 1.263                          | 0.000    | 0.007    | 0.222                  | 7.67                | 1.8988                       | 0.987             |
| 2.706                          | 0.000    | 0.049    | 0.422                  | 15.26               | 0.9519                       | 0.545             |
| 5.554                          | 0.000    | 0.310    | 0.770                  | 30.40               | 0.4675                       | 0.326             |
| 9.533                          | 0.000    | 1.124    | 1.330                  | 60.76               | 0.2040                       | 0.219             |
| 13.998                         | 0.000    | 2.428    | 2.180                  | 121.48              | 0.0549                       | 0.163             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| 20.867                         | 0.000    | 4.133    | 3.443                  | 241.80              | -0.0345                      | 0.130             |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 39.733                         | 0.000    | 3.129    | 4.748                  | 413.65              | 0.0263                       | 0.117             |
| 75.181                         | 0.000    | 3.196    | 6.222                  | 669.63              | 0.0214                       | 0.110             |
| 139.872                        | 0.000    | 3.357    | 7.974                  | 1062.66             | 0.0134                       | 0.106             |
| 261.688                        | 0.000    | 3.456    | 10.187                 | 1695.21             | 0.0085                       | 0.104             |
| 502.440                        | 0.000    | 3.533    | 13.015                 | 2727.21             | 0.0047                       | 0.102             |
| 977.871                        | 0.000    | 3.622    | 17.029                 | 4622.62             | 0.0003                       | 0.101             |
| 1519.698                       | 0.000    | 3.753    | 22.283                 | 7866.81             | -0.0061                      | 0.101             |
| 1525.097                       | 0.000    | 3.701    | 22.318                 | 7892.87             | -0.0037                      | 0.101             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.3322 M ABOVE DISCHARGE PORT

AVG DILUTION = 179.3414 B = 2.83 M

MAXIMUM RISE (CENTER) = 4.6136 M ABOVE DISCHARGE PORT

AVG DILUTION = 289.8933 B = 3.87 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 8 JETLAG 2000

TITLE Jet8

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

Total Q ... 0.0200 (m3/s) Qj ... 2.00E-02 (m3/s)

|              |                |           |                  |
|--------------|----------------|-----------|------------------|
| Port No. ... | 1              | Mj ...    | 1.41E-01 (m4/s2) |
| Depth ...    | 29.3000 (m)    | Bj ...    | 5.66E-03 (m4/s3) |
| Diameter ... | 0.0600 (m)     | lQ ...    | 0.0532 (m)       |
| Uj ...       | 7.0736 (m/s)   | lm ...    | 3.7613 (m)       |
| Ua ...       | 0.1000 (m/s)   | lb ...    | 5.6551 (m)       |
| dp/pa ...    | 0.02883        | lM ...    | 3.0675 (m)       |
| po ...       | 0.99827 (g/cc) | Sm ...    | 70.7355          |
| pa ...       | 1.02790 (g/cc) | Sb ...    | 159.8985         |
| Ver. ang ... | 0.00           | lQ/lm ... | 0.0141           |
| Hor. ang ... | 180.00         | lQ/lM ... | 0.0173           |
| Fd ...       | 54.31          | lm/lb ... | 0.6651           |
| Uj/Ua ...    | 70.74          | lM/lb ... | 0.5424           |

Coflowing case:

|         |         |
|---------|---------|
| dMj ... | 0.1395  |
| lm* ... | 3.7346  |
| Sm* ... | 69.7355 |

Stratification case:

|       |          |
|-------|----------|
| T ... | -4784.49 |
|-------|----------|

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 7.074             |
| -0.177                         | 0.000 | 0.000 | 0.059           | 1.95                | 7.5036                       | 3.524             |
| -0.533                         | 0.000 | 0.001 | 0.120           | 3.86                | 3.7780                       | 1.719             |
| -1.244                         | 0.000 | 0.008 | 0.245           | 7.66                | 1.9000                       | 0.813             |
| -2.661                         | 0.000 | 0.079 | 0.519           | 15.23               | 0.9527                       | 0.360             |
| -5.364                         | 0.000 | 0.800 | 1.043           | 28.31               | 0.4832                       | 0.166             |
| -6.894                         | 0.000 | 2.383 | 2.109           | 56.69               | 0.1863                       | 0.081             |
| -6.752                         | 0.000 | 3.269 | 3.394           | 113.19              | 0.0627                       | 0.063             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| -5.232                         | 0.000 | 4.227 | 4.370           | 223.48              | -0.0039                      | 0.075             |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |                   |
| 2.870                          | 0.000 | 4.974 | 5.322           | 363.56              | -0.0293                      | 0.082             |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |                   |
| 23.346                         | 0.000 | 4.797 | 6.712           | 629.90              | -0.0219                      | 0.089             |
| 68.397                         | 0.000 | 4.184 | 8.193           | 981.13              | 0.0085                       | 0.093             |
| 161.483                        | 0.000 | 4.538 | 10.226          | 1569.87             | -0.0089                      | 0.096             |
| 354.766                        | 0.000 | 4.436 | 12.829          | 2514.10             | -0.0038                      | 0.097             |
| 766.404                        | 0.000 | 4.277 | 16.438          | 4173.70             | 0.0040                       | 0.098             |
| 1294.827                       | 0.000 | 4.419 | 21.239          | 7017.20             | -0.0030                      | 0.099             |
| 1300.218                       | 0.000 | 4.300 | 21.314          | 7067.07             | 0.0029                       | 0.099             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 4.1453 M ABOVE DISCHARGE PORT

AVG DILUTION = 214.1874 B = 4.30 M

MAXIMUM RISE (CENTER) = 5.1972 M ABOVE DISCHARGE PORT

AVG DILUTION = 350.5213 B = 5.28 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

|          |      |             |
|----------|------|-------------|
| CASE NO. | 9    | JETLAG 2000 |
| TITLE    | Jet9 |             |

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |                        |
|----------------------------|------------------------|
| ENTRAINMENT HYPOTHESIS     | : ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : STANDARD             |
| TIME STEP CONTRL           | : VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : 1500                 |
| PRINTOUT INTERVAL          | : 100                  |
| MAX NUMBER OF ITERATIONS   | : 5                    |
| ITERATION ERROR BOUND      | : 0.00100              |
| APPROX RATIO OF MASS/DMASS | : 144.0                |

ENVIROMENTAL CONDITIONS

```

AAAAAAAAAAAAAAAAAAAAAAAAAAAA
      DEPTH(m)      S      T(C)      SIGMAT      U(m/s)
EXIT      29.30      0.00      20.00      -1.73      7.074
.....
AMBIENT    0.00      37.00      25.00      24.88      0.100
          30.00      38.50      18.00      27.97      0.100
  
```

#### LENGTH & DILUTION SCALES

```

AAAAAAAAAAAAAAAAAAAAAAAAAAAA
Total Q ... 0.0200 (m3/s)      Qj ... 2.00E-02 (m3/s)
Port No. ... 1      Mj ... 1.41E-01 (m4/s2)
Depth ... 29.3000 (m)      Bj ... 5.66E-03 (m4/s3)
Diameter ... 0.0600 (m)      lQ ... 0.0532 (m)
Uj ... 7.0736 (m/s)      lm ... 3.7613 (m)
Ua ... 0.1000 (m/s)      lb ... 5.6551 (m)
dp/pa ... 0.02883      lM ... 3.0675 (m)
po ... 0.99827 (g/cc)      sm ... 70.7355
pa ... 1.02790 (g/cc)      Sb ... 159.8985
Ver. ang ... 0.00      lQ/lm ... 0.0141
Hor. ang ... 0.00      lQ/lM ... 0.0173
Fd ... 54.31      lm/lb ... 0.6651
Uj/Ua ... 70.74      lM/lb ... 0.5424
  
```

#### Coflowing case:

```

dmj ... 0.1395
lm* ... 3.7346
sm* ... 69.7355
  
```

#### Stratification case:

```

T ... -4784.49
  
```

| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 7.074             |
| 0.179                          | 0.000    | 0.000    | 0.059                  | 1.95                | 7.5029                       | 3.623             |
| 0.540                          | 0.000    | 0.001    | 0.115                  | 3.86                | 3.7769                       | 1.867             |
| 1.263                          | 0.000    | 0.007    | 0.222                  | 7.67                | 1.8988                       | 0.987             |
| 2.706                          | 0.000    | 0.049    | 0.422                  | 15.26               | 0.9519                       | 0.545             |
| 5.554                          | 0.000    | 0.310    | 0.770                  | 30.40               | 0.4675                       | 0.326             |
| 9.533                          | 0.000    | 1.124    | 1.330                  | 60.76               | 0.2040                       | 0.219             |
| 13.998                         | 0.000    | 2.428    | 2.180                  | 121.48              | 0.0549                       | 0.163             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| 20.867                         | 0.000    | 4.133    | 3.443                  | 241.80              | -0.0345                      | 0.130             |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 39.733                         | 0.000    | 3.129    | 4.748                  | 413.65              | 0.0263                       | 0.117             |
| 75.181                         | 0.000    | 3.196    | 6.222                  | 669.63              | 0.0214                       | 0.110             |
| 139.872                        | 0.000    | 3.357    | 7.974                  | 1062.66             | 0.0134                       | 0.106             |
| 261.688                        | 0.000    | 3.456    | 10.187                 | 1695.21             | 0.0085                       | 0.104             |
| 502.440                        | 0.000    | 3.533    | 13.015                 | 2727.21             | 0.0047                       | 0.102             |
| 977.871                        | 0.000    | 3.622    | 17.029                 | 4622.62             | 0.0003                       | 0.101             |
| 1519.698                       | 0.000    | 3.753    | 22.283                 | 7866.81             | -0.0061                      | 0.101             |
| 1525.097                       | 0.000    | 3.701    | 22.318                 | 7892.87             | -0.0037                      | 0.101             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.3322 M ABOVE DISCHARGE PORT

AVG DILUTION = 179.3414 B = 2.83 M

MAXIMUM RISE (CENTER) = 4.6136 M ABOVE DISCHARGE PORT

AVG DILUTION = 289.8933 B = 3.87 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 10

JETLAG 2000

TITLE Jet10

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC

SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.66E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 3.7613 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 5.6551 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 3.0675 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 70.7355          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 159.8985         |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0141           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0173           |
| Fd       | ... | 54.31         | lm/lb | ... | 0.6651           |
| Uj/Ua    | ... | 70.74         | lM/lb | ... | 0.5424           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.1395  |
| lm* | ... | 3.7346  |
| Sm* | ... | 69.7355 |

Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 7.074             |
| -0.177                         | 0.000 | 0.000 | 0.059           | 1.95                | 7.5036                       | 3.524             |
| -0.533                         | 0.000 | 0.001 | 0.120           | 3.86                | 3.7780                       | 1.719             |
| -1.244                         | 0.000 | 0.008 | 0.245           | 7.66                | 1.9000                       | 0.813             |
| -2.661                         | 0.000 | 0.079 | 0.519           | 15.23               | 0.9527                       | 0.360             |
| -5.364                         | 0.000 | 0.800 | 1.043           | 28.31               | 0.4832                       | 0.166             |
| -6.894                         | 0.000 | 2.383 | 2.109           | 56.69               | 0.1863                       | 0.081             |
| -6.752                         | 0.000 | 3.269 | 3.394           | 113.19              | 0.0627                       | 0.063             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| -5.232                         | 0.000 | 4.227 | 4.370           | 223.48              | -0.0039                      | 0.075             |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |                   |
| 2.870                          | 0.000 | 4.974 | 5.322           | 363.56              | -0.0293                      | 0.082             |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |                   |
| 23.346                         | 0.000 | 4.797 | 6.712           | 629.90              | -0.0219                      | 0.089             |
| 68.397                         | 0.000 | 4.184 | 8.193           | 981.13              | 0.0085                       | 0.093             |
| 161.483                        | 0.000 | 4.538 | 10.226          | 1569.87             | -0.0089                      | 0.096             |
| 354.766                        | 0.000 | 4.436 | 12.829          | 2514.10             | -0.0038                      | 0.097             |
| 766.404                        | 0.000 | 4.277 | 16.438          | 4173.70             | 0.0040                       | 0.098             |
| 1294.827                       | 0.000 | 4.419 | 21.239          | 7017.20             | -0.0030                      | 0.099             |
| 1300.218                       | 0.000 | 4.300 | 21.314          | 7067.07             | 0.0029                       | 0.099             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 4.1453 M ABOVE DISCHARGE PORT

AVG DILUTION = 214.1874 B = 4.30 M

MAXIMUM RISE (CENTER) = 5.1972 M ABOVE DISCHARGE PORT

AVG DILUTION = 350.5213 B = 5.28 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

#### **SIMULACIÓN 4**

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 1 JETLAG 2000  
TITLE Jet1

##### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

##### ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

##### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0100 (m3/s) | Qj    | ... 1.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 3.54E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 2.83E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 3.5368 (m/s)  | lm    | ... 0.9403 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.3534 (m)       |
| dp/pa    | ... 0.02883       | lm    | ... 1.5337 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 17.6839          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 2.4984           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0565           |
| Hor. ang | ... 90.00         | lQ/lm | ... 0.0347           |
| Fd       | ... 27.15         | lm/lb | ... 2.6605           |
| Uj/Ua    | ... 17.68         | lm/lb | ... 4.3395           |

Stratification case:

T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 3.537    |
| 0.005                          | 0.182 | 0.000 | 0.059           | 1.95                | 7.5004                       | 1.789    |
| 0.036                          | 0.468 | 0.002 | 0.116           | 3.87                | 3.7711                       | 0.907    |
| 0.129                          | 0.818 | 0.010 | 0.226           | 7.69                | 1.8919                       | 0.481    |
| 0.337                          | 1.172 | 0.030 | 0.408           | 15.35               | 0.9473                       | 0.293    |
| 0.733                          | 1.494 | 0.068 | 0.659           | 30.61               | 0.4734                       | 0.225    |
| 1.772                          | 1.900 | 0.174 | 0.971           | 60.97               | 0.2337                       | 0.206    |
| 4.503                          | 2.436 | 0.502 | 1.384           | 121.60              | 0.1049                       | 0.202    |
| 10.129                         | 2.992 | 1.216 | 1.960           | 242.82              | 0.0265                       | 0.201    |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |          |
| 23.188                         | 3.619 | 2.278 | 2.763           | 479.46              | -0.0249                      | 0.200    |

MAXIMUM RISE REACHED  
 TRAPPING LEVEL REACHED

|          |        |       |        |          |         |       |
|----------|--------|-------|--------|----------|---------|-------|
| 60.668   | 4.605  | 1.531 | 3.702  | 860.21   | 0.0162  | 0.200 |
| 144.101  | 5.811  | 2.051 | 4.963  | 1546.86  | -0.0094 | 0.200 |
| 330.913  | 7.348  | 1.901 | 6.533  | 2680.85  | -0.0019 | 0.200 |
| 751.538  | 9.343  | 1.841 | 8.605  | 4651.74  | 0.0010  | 0.200 |
| 1676.924 | 11.877 | 1.916 | 11.455 | 8244.29  | -0.0027 | 0.200 |
| 2771.151 | 13.629 | 1.933 | 15.099 | 14323.29 | -0.0035 | 0.200 |
| 2781.898 | 13.642 | 1.931 | 15.131 | 14384.21 | -0.0035 | 0.200 |

NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 1.6731 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 332.5478 B = 2.30 M  
 MAXIMUM RISE (CENTER) = 2.3851 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 531.4107 B = 2.91 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 2 JETLAG 2000  
 TITLE Jet2

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^  

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0100 (m3/s) | Qj    | ... 1.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 3.54E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 2.83E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 3.5368 (m/s)  | lm    | ... 0.9403 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.3534 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 1.5337 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 17.6839          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 2.4984           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0565           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0347           |
| Fd       | ... 27.15         | lm/lb | ... 2.6605           |
| Uj/Ua    | ... 17.68         | lM/lb | ... 4.3395           |

Stratification case:  
 T ... -4784.49

| X      | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)    | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000  | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 3.537             |
| -0.173 | 0.000 | 0.000 | 0.061           | 1.95                | 7.5047                       | 1.688             |
| -0.522 | 0.000 | 0.004 | 0.128           | 3.85                | 3.7839                       | 0.749             |
| -1.180 | 0.000 | 0.043 | 0.278           | 7.31                | 1.9907                       | 0.301             |
| -2.100 | 0.000 | 0.337 | 0.517           | 11.61               | 1.2402                       | 0.138             |
| -2.280 | 0.000 | 0.563 | 0.839           | 17.13               | 0.8317                       | 0.077             |



|                                |       |       |       |         |         |       |
|--------------------------------|-------|-------|-------|---------|---------|-------|
| -2.139                         | 0.000 | 0.744 | 0.999 | 31.46   | 0.4458  | 0.100 |
| -1.149                         | 0.000 | 1.146 | 1.153 | 61.95   | 0.2117  | 0.148 |
| 1.259                          | 0.000 | 1.755 | 1.502 | 123.73  | 0.0839  | 0.174 |
| 6.365                          | 0.000 | 2.626 | 2.050 | 247.02  | 0.0104  | 0.187 |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |       |         |         |       |
| 21.498                         | 0.000 | 3.643 | 2.719 | 445.49  | -0.0328 | 0.192 |
| MAXIMUM RISE REACHED           |       |       |       |         |         |       |
| TRAPPING LEVEL REACHED         |       |       |       |         |         |       |
| 58.538                         | 0.000 | 2.782 | 3.493 | 748.65  | 0.0108  | 0.195 |
| 130.483                        | 0.000 | 3.218 | 4.523 | 1266.79 | -0.0102 | 0.197 |
| 275.557                        | 0.000 | 2.875 | 5.692 | 2017.64 | 0.0069  | 0.198 |
| 563.189                        | 0.000 | 2.937 | 7.157 | 3200.32 | 0.0038  | 0.199 |
| 1148.433                       | 0.000 | 3.035 | 9.046 | 5123.67 | -0.0010 | 0.199 |
| 1156.797                       | 0.000 | 2.986 | 9.078 | 5159.35 | 0.0014  | 0.199 |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.8238 M ABOVE DISCHARGE PORT

AVG DILUTION = 280.8942 B = 2.18 M

MAXIMUM RISE (CENTER) = 3.6436 M ABOVE DISCHARGE PORT

AVG DILUTION = 445.5409 B = 2.72 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

.....

CASE NO. 3 JETLAG 2000

TITLE Jet3

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |                        |
|----------------------------|------------------------|
| ENTRAINMENT HYPOTHESIS     | : ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : STANDARD             |
| TIME STEP CONTRL           | : VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : 1500                 |
| PRINTOUT INTERVAL          | : 100                  |
| MAX NUMBER OF ITERATIONS   | : 5                    |
| ITERATION ERROR BOUND      | : 0.00100              |
| APPROX RATIO OF MASS/DMASS | : 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0100 (m3/s) | Qj    | ... 1.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 3.54E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 2.83E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 3.5368 (m/s)  | lm    | ... 0.9403 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.3534 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 1.5337 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 17.6839          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 2.4984           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0565           |
| Hor. ang | ... 0.00          | lQ/lM | ... 0.0347           |
| Fd       | ... 27.15         | lm/lb | ... 2.6605           |
| Uj/Ua    | ... 17.68         | lM/lb | ... 4.3395           |

Coflowing case:

|     |             |
|-----|-------------|
| dMj | ... 0.0334  |
| lm* | ... 0.9133  |
| Sm* | ... 16.6839 |

Stratification case:

|   |              |
|---|--------------|
| T | ... -4784.49 |
|---|--------------|

| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 3.537             |
| 0.183                          | 0.000    | 0.000    | 0.057                  | 1.95                | 7.5019                       | 1.886             |
| 0.554                          | 0.000    | 0.003    | 0.108                  | 3.86                | 3.7754                       | 1.045             |
| 1.300                          | 0.000    | 0.022    | 0.198                  | 7.67                | 1.8968                       | 0.624             |
| 2.758                          | 0.000    | 0.119    | 0.343                  | 15.29               | 0.9476                       | 0.414             |
| 4.629                          | 0.000    | 0.347    | 0.561                  | 30.54               | 0.4660                       | 0.309             |
| 6.981                          | 0.000    | 0.709    | 0.871                  | 61.03               | 0.2201                       | 0.256             |
| 10.298                         | 0.000    | 1.226    | 1.302                  | 121.94              | 0.0915                       | 0.229             |
| 15.879                         | 0.000    | 1.972    | 1.900                  | 243.53              | 0.0188                       | 0.215             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| 30.730                         | 0.000    | 3.035    | 2.652                  | 457.74              | -0.0300                      | 0.207             |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 69.974                         | 0.000    | 2.139    | 3.375                  | 731.72              | 0.0159                       | 0.204             |
| 144.774                        | 0.000    | 2.625    | 4.432                  | 1250.61             | -0.0081                      | 0.203             |
| 291.843                        | 0.000    | 2.361    | 5.612                  | 1994.77             | 0.0052                       | 0.202             |
| 580.082                        | 0.000    | 2.454    | 7.063                  | 3150.98             | 0.0007                       | 0.201             |
| 1162.325                       | 0.000    | 2.520    | 8.963                  | 5064.27             | -0.0027                      | 0.201             |
| 2196.100                       | 0.000    | 2.522    | 11.737                 | 8671.64             | -0.0027                      | 0.200             |
| 2207.010                       | 0.000    | 2.464    | 11.773                 | 8725.00             | 0.0001                       | 0.200             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.3087 M ABOVE DISCHARGE PORT

AVG DILUTION = 309.2886 B = 2.16 M

MAXIMUM RISE (CENTER) = 3.0735 M ABOVE DISCHARGE PORT

AVG DILUTION = 466.2746 B = 2.68 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 4 JETLAG 2000

TITLE Jet4

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0100 (m3/s) | Qj    | ... 1.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 3.54E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 2.83E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 3.5368 (m/s)  | lm    | ... 0.9403 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.3534 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 1.5337 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 17.6839          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 2.4984           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0565           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0347           |
| Fd       | ... 27.15         | lm/lb | ... 2.6605           |
| Uj/Ua    | ... 17.68         | lM/lb | ... 4.3395           |

Coflowing case:

dMj ... 0.0334  
lm\* ... 0.9133  
sm\* ... 16.6839

Stratification case:

T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 3.537    |
| -0.173                         | 0.000 | 0.000 | 0.061           | 1.95                | 7.5047                       | 1.688    |
| -0.522                         | 0.000 | 0.004 | 0.128           | 3.85                | 3.7839                       | 0.749    |
| -1.180                         | 0.000 | 0.043 | 0.278           | 7.31                | 1.9907                       | 0.301    |
| -2.100                         | 0.000 | 0.337 | 0.517           | 11.61               | 1.2402                       | 0.138    |
| -2.280                         | 0.000 | 0.563 | 0.839           | 17.13               | 0.8317                       | 0.077    |
| -2.139                         | 0.000 | 0.744 | 0.999           | 31.46               | 0.4458                       | 0.100    |
| -1.149                         | 0.000 | 1.146 | 1.153           | 61.95               | 0.2117                       | 0.148    |
| 1.259                          | 0.000 | 1.755 | 1.502           | 123.73              | 0.0839                       | 0.174    |
| 6.365                          | 0.000 | 2.626 | 2.050           | 247.02              | 0.0104                       | 0.187    |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |          |
| 21.498                         | 0.000 | 3.643 | 2.719           | 445.49              | -0.0328                      | 0.192    |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |          |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |          |
| 58.538                         | 0.000 | 2.782 | 3.493           | 748.65              | 0.0108                       | 0.195    |
| 130.483                        | 0.000 | 3.218 | 4.523           | 1266.79             | -0.0102                      | 0.197    |
| 275.557                        | 0.000 | 2.875 | 5.692           | 2017.64             | 0.0069                       | 0.198    |
| 563.189                        | 0.000 | 2.937 | 7.157           | 3200.32             | 0.0038                       | 0.199    |
| 1148.433                       | 0.000 | 3.035 | 9.046           | 5123.67             | -0.0010                      | 0.199    |
| 1156.797                       | 0.000 | 2.986 | 9.078           | 5159.35             | 0.0014                       | 0.199    |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.8238 M ABOVE DISCHARGE PORT

AVG DILUTION = 280.8942 B = 2.18 M

MAXIMUM RISE (CENTER) = 3.6436 M ABOVE DISCHARGE PORT

AVG DILUTION = 445.5409 B = 2.72 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 5 JETLAG 2000  
TITLE Jet5

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500

PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |    |                      |
|----------|-------------------|----|----------------------|
| Total Q  | ... 0.0100 (m3/s) | Qj | ... 1.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj | ... 3.54E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj | ... 2.83E-03 (m4/s3) |

|          |     |               |       |     |            |
|----------|-----|---------------|-------|-----|------------|
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m) |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 0.9403 (m) |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.3534 (m) |
| dp/pa    | ... | 0.02883       | lM    | ... | 1.5337 (m) |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 17.6839    |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 2.4984     |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0565     |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0347     |
| Fd       | ... | 27.15         | lm/lb | ... | 2.6605     |
| Uj/Ua    | ... | 17.68         | lM/lb | ... | 4.3395     |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0334  |
| lm* | ... | 0.9133  |
| Sm* | ... | 16.6839 |

Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

| X      | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)    | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000  | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 3.537    |
| 0.183  | 0.000 | 0.000 | 0.057           | 1.95                | 7.5019                       | 1.886    |
| 0.554  | 0.000 | 0.003 | 0.108           | 3.86                | 3.7754                       | 1.045    |
| 1.300  | 0.000 | 0.022 | 0.198           | 7.67                | 1.8968                       | 0.624    |
| 2.758  | 0.000 | 0.119 | 0.343           | 15.29               | 0.9476                       | 0.414    |
| 4.629  | 0.000 | 0.347 | 0.561           | 30.54               | 0.4660                       | 0.309    |
| 6.981  | 0.000 | 0.709 | 0.871           | 61.03               | 0.2201                       | 0.256    |
| 10.298 | 0.000 | 1.226 | 1.302           | 121.94              | 0.0915                       | 0.229    |
| 15.879 | 0.000 | 1.972 | 1.900           | 243.53              | 0.0188                       | 0.215    |

NEUTRAL BUOYANCY LEVEL REACHED

|        |       |       |       |        |         |       |
|--------|-------|-------|-------|--------|---------|-------|
| 30.730 | 0.000 | 3.035 | 2.652 | 457.74 | -0.0300 | 0.207 |
|--------|-------|-------|-------|--------|---------|-------|

MAXIMUM RISE REACHED

TRAPPING LEVEL REACHED

|          |       |       |        |         |         |       |
|----------|-------|-------|--------|---------|---------|-------|
| 69.974   | 0.000 | 2.139 | 3.375  | 731.72  | 0.0159  | 0.204 |
| 144.774  | 0.000 | 2.625 | 4.432  | 1250.61 | -0.0081 | 0.203 |
| 291.843  | 0.000 | 2.361 | 5.612  | 1994.77 | 0.0052  | 0.202 |
| 580.082  | 0.000 | 2.454 | 7.063  | 3150.98 | 0.0007  | 0.201 |
| 1162.325 | 0.000 | 2.520 | 8.963  | 5064.27 | -0.0027 | 0.201 |
| 2196.100 | 0.000 | 2.522 | 11.737 | 8671.64 | -0.0027 | 0.200 |
| 2207.010 | 0.000 | 2.464 | 11.773 | 8725.00 | 0.0001  | 0.200 |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.3087 M ABOVE DISCHARGE PORT

AVG DILUTION = 309.2886 B = 2.16 M

MAXIMUM RISE (CENTER) = 3.0735 M ABOVE DISCHARGE PORT

AVG DILUTION = 466.2746 B = 2.68 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

..... JETLAG 2000

CASE NO. 6

TITLE Jet6

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |   |                      |
|----------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS     | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : | STANDARD             |
| TIME STEP CONTRL           | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : | 1500                 |
| PRINTOUT INTERVAL          | : | 100                  |
| MAX NUMBER OF ITERATIONS   | : | 5                    |
| ITERATION ERROR BOUND      | : | 0.00100              |
| APPROX RATIO OF MASS/DMASS | : | 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         |          |       |       |        |        |
|---------|----------|-------|-------|--------|--------|
|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

#### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.83E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 0.9403 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.3534 (m)       |
| dp/pa    | ... | 0.02883       | lm    | ... | 1.5337 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 17.6839          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 2.4984           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0565           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0347           |
| Fd       | ... | 27.15         | lm/lb | ... | 2.6605           |
| Uj/Ua    | ... | 17.68         | lM/lb | ... | 4.3395           |

#### Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0334  |
| lm* | ... | 0.9133  |
| Sm* | ... | 16.6839 |

#### Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 3.537             |
| -0.173                         | 0.000 | 0.000 | 0.061           | 1.95                | 7.5047                       | 1.688             |
| -0.522                         | 0.000 | 0.004 | 0.128           | 3.85                | 3.7839                       | 0.749             |
| -1.180                         | 0.000 | 0.043 | 0.278           | 7.31                | 1.9907                       | 0.301             |
| -2.100                         | 0.000 | 0.337 | 0.517           | 11.61               | 1.2402                       | 0.138             |
| -2.280                         | 0.000 | 0.563 | 0.839           | 17.13               | 0.8317                       | 0.077             |
| -2.139                         | 0.000 | 0.744 | 0.999           | 31.46               | 0.4458                       | 0.100             |
| -1.149                         | 0.000 | 1.146 | 1.153           | 61.95               | 0.2117                       | 0.148             |
| 1.259                          | 0.000 | 1.755 | 1.502           | 123.73              | 0.0839                       | 0.174             |
| 6.365                          | 0.000 | 2.626 | 2.050           | 247.02              | 0.0104                       | 0.187             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| 21.498                         | 0.000 | 3.643 | 2.719           | 445.49              | -0.0328                      | 0.192             |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |                   |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |                   |
| 58.538                         | 0.000 | 2.782 | 3.493           | 748.65              | 0.0108                       | 0.195             |
| 130.483                        | 0.000 | 3.218 | 4.523           | 1266.79             | -0.0102                      | 0.197             |
| 275.557                        | 0.000 | 2.875 | 5.692           | 2017.64             | 0.0069                       | 0.198             |
| 563.189                        | 0.000 | 2.937 | 7.157           | 3200.32             | 0.0038                       | 0.199             |
| 1148.433                       | 0.000 | 3.035 | 9.046           | 5123.67             | -0.0010                      | 0.199             |
| 1156.797                       | 0.000 | 2.986 | 9.078           | 5159.35             | 0.0014                       | 0.199             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.8238 M ABOVE DISCHARGE PORT

AVG DILUTION = 280.8942 B = 2.18 M

MAXIMUM RISE (CENTER) = 3.6436 M ABOVE DISCHARGE PORT

AVG DILUTION = 445.5409 B = 2.72 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

.....

CASE NO. 7 JETLAG 2000

TITLE Jet7

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC

SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.83E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 0.9403 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.3534 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 1.5337 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 17.6839          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 2.4984           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0565           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0347           |
| Fd       | ... | 27.15         | lm/lb | ... | 2.6605           |
| Uj/Ua    | ... | 17.68         | lM/lb | ... | 4.3395           |

Coflowing case:

dMj ... 0.0334  
 lm\* ... 0.9133  
 Sm\* ... 16.6839

Stratification case:

T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 3.537             |
| 0.183                          | 0.000 | 0.000 | 0.057           | 1.95                | 7.5019                       | 1.886             |
| 0.554                          | 0.000 | 0.003 | 0.108           | 3.86                | 3.7754                       | 1.045             |
| 1.300                          | 0.000 | 0.022 | 0.198           | 7.67                | 1.8968                       | 0.624             |
| 2.758                          | 0.000 | 0.119 | 0.343           | 15.29               | 0.9476                       | 0.414             |
| 4.629                          | 0.000 | 0.347 | 0.561           | 30.54               | 0.4660                       | 0.309             |
| 6.981                          | 0.000 | 0.709 | 0.871           | 61.03               | 0.2201                       | 0.256             |
| 10.298                         | 0.000 | 1.226 | 1.302           | 121.94              | 0.0915                       | 0.229             |
| 15.879                         | 0.000 | 1.972 | 1.900           | 243.53              | 0.0188                       | 0.215             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| 30.730                         | 0.000 | 3.035 | 2.652           | 457.74              | -0.0300                      | 0.207             |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |                   |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |                   |
| 69.974                         | 0.000 | 2.139 | 3.375           | 731.72              | 0.0159                       | 0.204             |
| 144.774                        | 0.000 | 2.625 | 4.432           | 1250.61             | -0.0081                      | 0.203             |
| 291.843                        | 0.000 | 2.361 | 5.612           | 1994.77             | 0.0052                       | 0.202             |
| 580.082                        | 0.000 | 2.454 | 7.063           | 3150.98             | 0.0007                       | 0.201             |
| 1162.325                       | 0.000 | 2.520 | 8.963           | 5064.27             | -0.0027                      | 0.201             |
| 2196.100                       | 0.000 | 2.522 | 11.737          | 8671.64             | -0.0027                      | 0.200             |
| 2207.010                       | 0.000 | 2.464 | 11.773          | 8725.00             | 0.0001                       | 0.200             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.3087 M ABOVE DISCHARGE PORT

AVG DILUTION = 309.2886 B = 2.16 M

MAXIMUM RISE (CENTER) = 3.0735 M ABOVE DISCHARGE PORT

AVG DILUTION = 466.2746 B = 2.68 M

```

COMPUTATIONS CEASE:  NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)
1
ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT
.....
CASE NO.      8                                           JETLAG 2000
TITLE        Jet8

INPUT PARAMETERS
AAAAAAAAAAAAAAAA
ENTRAINMENT HYPOTHESIS      : ASYMMETRIC
SHEAR ENTRAINMENT           : VARIABLE (0 - 0.085)
COFLOW FACTOR               : STANDARD
TIME STEP CONTRL            : VARIABLE ( > 0.985 )
MAX NUMBER OF TIME STEPS    : 1500
PRINTOUT INTERVAL          : 100
MAX NUMBER OF ITERATIONS    : 5
ITERATION ERROR BOUND       : 0.00100
APPROX RATIO OF MASS/DMASS  : 144.0

ENVIROMENTAL CONDITIONS
AAAAAAAAAAAAAAAA
      DEPTH(m)      S      T(C)      SIGMAT      U(m/s)
EXIT      29.30      0.00      20.00      -1.73      3.537
.....
AMBIENT    0.00      37.00      25.00      24.88      0.200
           30.00      38.50      18.00      27.97      0.200

LENGTH & DILUTION SCALES
AAAAAAAAAAAAAAAA
Total Q ... 0.0100 (m3/s)      Qj ... 1.00E-02 (m3/s)
Port No. ... 1                Mj ... 3.54E-02 (m4/s2)
Depth ... 29.3000 (m)         Bj ... 2.83E-03 (m4/s3)
Diameter ... 0.0600 (m)       lQ ... 0.0532 (m)
Uj ... 3.5368 (m/s)           lm ... 0.9403 (m)
Ua ... 0.2000 (m/s)           lb ... 0.3534 (m)
dp/pa ... 0.02883            lM ... 1.5337 (m)
po ... 0.99827 (g/cc)         sm ... 17.6839
pa ... 1.02790 (g/cc)         Sb ... 2.4984
Ver. ang ... 0.00             lQ/lm ... 0.0565
Hor. ang ... 180.00           lQ/lM ... 0.0347
Fd ... 27.15                  lm/lb ... 2.6605
Uj/Ua ... 17.68              lM/lb ... 4.3395

Coflowing case:
dmj ... 0.0334
lm* ... 0.9133
sm* ... 16.6839

Stratification case:
T ... -4784.49

      X      Y      Z      PLUME      AVERAGE      DENSITY      VELOCITY
      (m)    (m)    (m)    RADIUS    DILUTION      DIFF.        (m/s)
      .....
      0.000    0.000    0.000    0.030    1.00    29.6379    3.537
      -0.173    0.000    0.000    0.061    1.95    7.5047    1.688
      -0.522    0.000    0.004    0.128    3.85    3.7839    0.749
      -1.180    0.000    0.043    0.278    7.31    1.9907    0.301
      -2.100    0.000    0.337    0.517    11.61    1.2402    0.138
      -2.280    0.000    0.563    0.839    17.13    0.8317    0.077
      -2.139    0.000    0.744    0.999    31.46    0.4458    0.100
      -1.149    0.000    1.146    1.153    61.95    0.2117    0.148
      1.259     0.000    1.755    1.502    123.73    0.0839    0.174
      6.365     0.000    2.626    2.050    247.02    0.0104    0.187
NEUTRAL BUOYANCY LEVEL REACHED
21.498     0.000    3.643    2.719    445.49    -0.0328    0.192
MAXIMUM RISE REACHED
TRAPPING LEVEL REACHED
58.538     0.000    2.782    3.493    748.65    0.0108    0.195
130.483    0.000    3.218    4.523    1266.79    -0.0102    0.197
275.557    0.000    2.875    5.692    2017.64    0.0069    0.198

```

|          |       |       |       |         |         |       |
|----------|-------|-------|-------|---------|---------|-------|
| 563.189  | 0.000 | 2.937 | 7.157 | 3200.32 | 0.0038  | 0.199 |
| 1148.433 | 0.000 | 3.035 | 9.046 | 5123.67 | -0.0010 | 0.199 |
| 1156.797 | 0.000 | 2.986 | 9.078 | 5159.35 | 0.0014  | 0.199 |

NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 2.8238 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 280.8942 B = 2.18 M  
 MAXIMUM RISE (CENTER) = 3.6436 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 445.5409 B = 2.72 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 9 JETLAG 2000  
 TITLE Jet9

INPUT PARAMETERS  
 ^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^  

|      |          |      |       |        |        |
|------|----------|------|-------|--------|--------|
| EXIT | DEPTH(m) | S    | T(C)  | SIGMAT | U(m/s) |
|      | 29.30    | 0.00 | 20.00 | -1.73  | 3.537  |

|         |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|
| AMBIENT | 0.00  | 37.00 | 25.00 | 24.88 | 0.200 |
|         | 30.00 | 38.50 | 18.00 | 27.97 | 0.200 |

LENGTH & DILUTION SCALES  
 ^^^  

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.83E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| uj       | ... | 3.5368 (m/s)  | lm    | ... | 0.9403 (m)       |
| ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.3534 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 1.5337 (m)       |
| po       | ... | 0.99827(g/cc) | sm    | ... | 17.6839          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 2.4984           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0565           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0347           |
| Fd       | ... | 27.15         | lm/lb | ... | 2.6605           |
| uj/ua    | ... | 17.68         | lM/lb | ... | 4.3395           |

Coflowing case:  
 dmj ... 0.0334  
 lm\* ... 0.9133  
 sm\* ... 16.6839

Stratification case:  
 T ... -4784.49

| X     | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|-------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)   | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000 | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 3.537    |
| 0.183 | 0.000 | 0.000 | 0.057           | 1.95                | 7.5019                       | 1.886    |
| 0.554 | 0.000 | 0.003 | 0.108           | 3.86                | 3.7754                       | 1.045    |
| 1.300 | 0.000 | 0.022 | 0.198           | 7.67                | 1.8968                       | 0.624    |
| 2.758 | 0.000 | 0.119 | 0.343           | 15.29               | 0.9476                       | 0.414    |
| 4.629 | 0.000 | 0.347 | 0.561           | 30.54               | 0.4660                       | 0.309    |
| 6.981 | 0.000 | 0.709 | 0.871           | 61.03               | 0.2201                       | 0.256    |



|                                |       |       |        |         |         |       |
|--------------------------------|-------|-------|--------|---------|---------|-------|
| 10.298                         | 0.000 | 1.226 | 1.302  | 121.94  | 0.0915  | 0.229 |
| 15.879                         | 0.000 | 1.972 | 1.900  | 243.53  | 0.0188  | 0.215 |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |        |         |         |       |
| 30.730                         | 0.000 | 3.035 | 2.652  | 457.74  | -0.0300 | 0.207 |
| MAXIMUM RISE REACHED           |       |       |        |         |         |       |
| TRAPPING LEVEL REACHED         |       |       |        |         |         |       |
| 69.974                         | 0.000 | 2.139 | 3.375  | 731.72  | 0.0159  | 0.204 |
| 144.774                        | 0.000 | 2.625 | 4.432  | 1250.61 | -0.0081 | 0.203 |
| 291.843                        | 0.000 | 2.361 | 5.612  | 1994.77 | 0.0052  | 0.202 |
| 580.082                        | 0.000 | 2.454 | 7.063  | 3150.98 | 0.0007  | 0.201 |
| 1162.325                       | 0.000 | 2.520 | 8.963  | 5064.27 | -0.0027 | 0.201 |
| 2196.100                       | 0.000 | 2.522 | 11.737 | 8671.64 | -0.0027 | 0.200 |
| 2207.010                       | 0.000 | 2.464 | 11.773 | 8725.00 | 0.0001  | 0.200 |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.3087 M ABOVE DISCHARGE PORT

AVG DILUTION = 309.2886 B = 2.16 M

MAXIMUM RISE (CENTER) = 3.0735 M ABOVE DISCHARGE PORT

AVG DILUTION = 466.2746 B = 2.68 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 10 JETLAG 2000

TITLE Jet10

INPUT PARAMETERS

^^^^^^^^^^^^^^^^^^^^

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES

^^^^^^^^^^^^^^^^^^^^

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0100 (m3/s) | Qj    | ... 1.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 3.54E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 2.83E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 3.5368 (m/s)  | lm    | ... 0.9403 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.3534 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 1.5337 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 17.6839          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 2.4984           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0565           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0347           |
| Fd       | ... 27.15         | lm/lb | ... 2.6605           |
| Uj/Ua    | ... 17.68         | lM/lb | ... 4.3395           |

Coflowing case:

dMj ... 0.0334  
 lm\* ... 0.9133  
 Sm\* ... 16.6839

Stratification case:

T ... -4784.49

| X | Y | Z | PLUME | AVERAGE | DENSITY | VELOCITY |
|---|---|---|-------|---------|---------|----------|
|---|---|---|-------|---------|---------|----------|

| (m)                            | (m)   | (m)   | RADIUS<br>(m) | DILUTION | DIFF.<br>(sigmat) | (m/s) |
|--------------------------------|-------|-------|---------------|----------|-------------------|-------|
| 0.000                          | 0.000 | 0.000 | 0.030         | 1.00     | 29.6379           | 3.537 |
| -0.173                         | 0.000 | 0.000 | 0.061         | 1.95     | 7.5047            | 1.688 |
| -0.522                         | 0.000 | 0.004 | 0.128         | 3.85     | 3.7839            | 0.749 |
| -1.180                         | 0.000 | 0.043 | 0.278         | 7.31     | 1.9907            | 0.301 |
| -2.100                         | 0.000 | 0.337 | 0.517         | 11.61    | 1.2402            | 0.138 |
| -2.280                         | 0.000 | 0.563 | 0.839         | 17.13    | 0.8317            | 0.077 |
| -2.139                         | 0.000 | 0.744 | 0.999         | 31.46    | 0.4458            | 0.100 |
| -1.149                         | 0.000 | 1.146 | 1.153         | 61.95    | 0.2117            | 0.148 |
| 1.259                          | 0.000 | 1.755 | 1.502         | 123.73   | 0.0839            | 0.174 |
| 6.365                          | 0.000 | 2.626 | 2.050         | 247.02   | 0.0104            | 0.187 |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |               |          |                   |       |
| 21.498                         | 0.000 | 3.643 | 2.719         | 445.49   | -0.0328           | 0.192 |
| MAXIMUM RISE REACHED           |       |       |               |          |                   |       |
| TRAPPING LEVEL REACHED         |       |       |               |          |                   |       |
| 58.538                         | 0.000 | 2.782 | 3.493         | 748.65   | 0.0108            | 0.195 |
| 130.483                        | 0.000 | 3.218 | 4.523         | 1266.79  | -0.0102           | 0.197 |
| 275.557                        | 0.000 | 2.875 | 5.692         | 2017.64  | 0.0069            | 0.198 |
| 563.189                        | 0.000 | 2.937 | 7.157         | 3200.32  | 0.0038            | 0.199 |
| 1148.433                       | 0.000 | 3.035 | 9.046         | 5123.67  | -0.0010           | 0.199 |
| 1156.797                       | 0.000 | 2.986 | 9.078         | 5159.35  | 0.0014            | 0.199 |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.8238 M ABOVE DISCHARGE PORT

AVG DILUTION = 280.8942 B = 2.18 M

MAXIMUM RISE (CENTER) = 3.6436 M ABOVE DISCHARGE PORT

AVG DILUTION = 445.5409 B = 2.72 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

## SIMULACIÓN 5

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 1 JETLAG 2000

TITLE Jet1

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 4.24E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 1.4105 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.5302 (m)       |
| dp/pa    | ... | 0.02883       | lm    | ... | 2.3006 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 26.5258          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 3.7476           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0377           |

Hor. ang ... 90.00                      lq/lm ... 0.0231  
 Fd ... 40.73                      lm/lb ... 2.6605  
 Uj/Ua ... 26.53                      lm/lb ... 4.3395

Stratification case:  
 T ... -4784.49

| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 5.305             |
| 0.003                          | 0.183    | 0.000    | 0.059                  | 1.94                | 7.5435                       | 2.697             |
| 0.028                          | 0.522    | 0.001    | 0.116                  | 3.84                | 3.7948                       | 1.359             |
| 0.113                          | 1.001    | 0.007    | 0.228                  | 7.64                | 1.9049                       | 0.699             |
| 0.320                          | 1.533    | 0.025    | 0.433                  | 15.24               | 0.9541                       | 0.387             |
| 0.736                          | 2.048    | 0.065    | 0.750                  | 30.42               | 0.4763                       | 0.258             |
| 1.603                          | 2.563    | 0.148    | 1.160                  | 60.65               | 0.2358                       | 0.215             |
| 3.991                          | 3.263    | 0.405    | 1.681                  | 120.86              | 0.1087                       | 0.204             |
| 9.732                          | 4.113    | 1.093    | 2.389                  | 241.18              | 0.0291                       | 0.202             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| 23.620                         | 5.122    | 2.219    | 3.378                  | 478.08              | -0.0258                      | 0.200             |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 64.699                         | 6.694    | 1.534    | 4.631                  | 897.81              | 0.0120                       | 0.200             |
| 161.496                        | 8.664    | 1.757    | 6.313                  | 1669.11             | 0.0019                       | 0.200             |
| 392.466                        | 11.246   | 1.797    | 8.477                  | 3009.61             | -0.0003                      | 0.200             |
| 952.943                        | 14.711   | 1.737    | 11.407                 | 5449.80             | 0.0026                       | 0.200             |
| 2029.920                       | 18.490   | 1.777    | 15.383                 | 9911.52             | 0.0005                       | 0.200             |
| 3117.221                       | 20.667   | 1.859    | 20.193                 | 17079.61            | -0.0035                      | 0.200             |
| 3128.196                       | 20.683   | 1.751    | 20.261                 | 17195.28            | 0.0018                       | 0.200             |

NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 1.5930 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 332.5764 B = 2.81 M  
 MAXIMUM RISE (CENTER) = 2.3123 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 531.8036 B = 3.56 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 2 JETLAG 2000  
 TITLE Jet2

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^^^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^^^^^  

|          |                   |    |                      |
|----------|-------------------|----|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj | ... 4.24E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lq | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | lm | ... 1.4105 (m)       |

|          |     |               |       |     |            |
|----------|-----|---------------|-------|-----|------------|
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.5302 (m) |
| dp/pa    | ... | 0.02883       | lm    | ... | 2.3006 (m) |
| po       | ... | 0.99827(g/cc) | sm    | ... | 26.5258    |
| pa       | ... | 1.02790(g/cc) | sb    | ... | 3.7476     |
| Ver. ang | ... | 0.00          | lq/lm | ... | 0.0377     |
| Hor. ang | ... | 180.00        | lq/lm | ... | 0.0231     |
| Fd       | ... | 40.73         | lm/lb | ... | 2.6605     |
| Uj/Ua    | ... | 26.53         | lm/lb | ... | 4.3395     |

Stratification case:  
T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 5.305    |
| -0.175                         | 0.000 | 0.000 | 0.060           | 1.95                | 7.5042                       | 2.582    |
| -0.527                         | 0.000 | 0.002 | 0.124           | 3.86                | 3.7789                       | 1.196    |
| -1.223                         | 0.000 | 0.018 | 0.267           | 7.60                | 1.9160                       | 0.507    |
| -2.508                         | 0.000 | 0.196 | 0.535           | 13.07               | 1.1056                       | 0.218    |
| -3.395                         | 0.000 | 0.677 | 0.970           | 20.33               | 0.6918                       | 0.103    |
| -3.458                         | 0.000 | 0.940 | 1.457           | 33.07               | 0.4155                       | 0.074    |
| -2.848                         | 0.000 | 1.322 | 1.545           | 61.69               | 0.2082                       | 0.123    |
| -0.515                         | 0.000 | 2.053 | 1.909           | 123.21              | 0.0778                       | 0.161    |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |          |
| 4.950                          | 0.000 | 3.092 | 2.553           | 245.92              | 0.0012                       | 0.180    |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |          |
| 23.645                         | 0.000 | 3.909 | 3.258           | 416.44              | -0.0288                      | 0.187    |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |          |
| 62.896                         | 0.000 | 3.447 | 4.293           | 744.93              | -0.0069                      | 0.193    |
| 145.173                        | 0.000 | 3.307 | 5.418           | 1202.78             | 0.0015                       | 0.196    |
| 308.653                        | 0.000 | 3.433 | 6.795           | 1906.91             | -0.0051                      | 0.197    |
| 636.240                        | 0.000 | 3.352 | 8.578           | 3055.12             | -0.0012                      | 0.198    |
| 1317.183                       | 0.000 | 3.387 | 10.889          | 4939.84             | -0.0029                      | 0.199    |
| 1326.725                       | 0.000 | 3.341 | 10.918          | 4966.24             | -0.0006                      | 0.199    |

NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 3.1159 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 249.2542 B = 2.57 M  
 MAXIMUM RISE (CENTER) = 4.0389 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 395.2737 B = 3.18 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 3 JETLAG 2000  
 TITLE Jet3

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 4.24E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 1.4105 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.5302 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 2.3006 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 26.5258          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 3.7476           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0377           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0231           |
| Fd       | ... | 40.73         | lm/lb | ... | 2.6605           |
| Uj/Ua    | ... | 26.53         | lM/lb | ... | 4.3395           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0766  |
| lm* | ... | 1.3836  |
| sm* | ... | 25.5258 |

Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 5.305    |
| 0.181                          | 0.000 | 0.000 | 0.058           | 1.95                | 7.5024                       | 2.779    |
| 0.548                          | 0.000 | 0.001 | 0.111           | 3.86                | 3.7761                       | 1.494    |
| 1.283                          | 0.000 | 0.011 | 0.208           | 7.67                | 1.8978                       | 0.849    |
| 2.764                          | 0.000 | 0.066 | 0.372           | 15.27               | 0.9506                       | 0.526    |
| 5.311                          | 0.000 | 0.289 | 0.631           | 30.48               | 0.4678                       | 0.365    |
| 8.402                          | 0.000 | 0.709 | 1.011           | 60.91               | 0.2188                       | 0.285    |
| 12.519                         | 0.000 | 1.339 | 1.545           | 121.72              | 0.0868                       | 0.243    |
| 19.177                         | 0.000 | 2.242 | 2.287           | 243.08              | 0.0107                       | 0.222    |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |          |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |          |
| 38.024                         | 0.000 | 3.290 | 3.114           | 429.76              | -0.0335                      | 0.212    |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |          |
| 84.045                         | 0.000 | 2.703 | 4.150           | 746.15              | -0.0045                      | 0.207    |
| 173.522                        | 0.000 | 2.579 | 5.325           | 1212.25             | 0.0031                       | 0.204    |
| 346.720                        | 0.000 | 2.663 | 6.736           | 1925.30             | -0.0013                      | 0.203    |
| 685.830                        | 0.000 | 2.727 | 8.527           | 3070.36             | -0.0045                      | 0.202    |
| 1379.682                       | 0.000 | 2.628 | 10.856          | 4961.41             | 0.0003                       | 0.201    |
| 2452.842                       | 0.000 | 2.706 | 14.306          | 8597.62             | -0.0035                      | 0.201    |
| 2463.601                       | 0.000 | 2.699 | 14.335          | 8632.45             | -0.0031                      | 0.201    |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.4464 M ABOVE DISCHARGE PORT

AVG DILUTION = 275.1171 B = 2.45 M

MAXIMUM RISE (CENTER) = 3.2994 M ABOVE DISCHARGE PORT

AVG DILUTION = 426.4832 B = 3.10 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

|          |      |             |
|----------|------|-------------|
| CASE NO. | 4    | JETLAG 2000 |
| TITLE    | Jet4 |             |

INPUT PARAMETERS

AAAAAAAAAAAAAAAA

|                            |                        |
|----------------------------|------------------------|
| ENTRAINMENT HYPOTHESIS     | : ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : STANDARD             |
| TIME STEP CONTRL           | : VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : 1500                 |
| PRINTOUT INTERVAL          | : 100                  |
| MAX NUMBER OF ITERATIONS   | : 5                    |
| ITERATION ERROR BOUND      | : 0.00100              |
| APPROX RATIO OF MASS/DMASS | : 144.0                |

# ENVIROMENTAL CONDITIONS

^^

|         |          |       |       |        |        |
|---------|----------|-------|-------|--------|--------|
|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

# LENGTH & DILUTION SCALES

^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 4.24E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 1.4105 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.5302 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 2.3006 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 26.5258          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 3.7476           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0377           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0231           |
| Fd       | ... | 40.73         | lm/lb | ... | 2.6605           |
| Uj/Ua    | ... | 26.53         | lM/lb | ... | 4.3395           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0766  |
| lm* | ... | 1.3836  |
| Sm* | ... | 25.5258 |

Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 5.305    |
| -0.175                         | 0.000 | 0.000 | 0.060           | 1.95                | 7.5042                       | 2.582    |
| -0.527                         | 0.000 | 0.002 | 0.124           | 3.86                | 3.7789                       | 1.196    |
| -1.223                         | 0.000 | 0.018 | 0.267           | 7.60                | 1.9160                       | 0.507    |
| -2.508                         | 0.000 | 0.196 | 0.535           | 13.07               | 1.1056                       | 0.218    |
| -3.395                         | 0.000 | 0.677 | 0.970           | 20.33               | 0.6918                       | 0.103    |
| -3.458                         | 0.000 | 0.940 | 1.457           | 33.07               | 0.4155                       | 0.074    |
| -2.848                         | 0.000 | 1.322 | 1.545           | 61.69               | 0.2082                       | 0.123    |
| -0.515                         | 0.000 | 2.053 | 1.909           | 123.21              | 0.0778                       | 0.161    |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |          |
| 4.950                          | 0.000 | 3.092 | 2.553           | 245.92              | 0.0012                       | 0.180    |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |          |
| 23.645                         | 0.000 | 3.909 | 3.258           | 416.44              | -0.0288                      | 0.187    |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |          |
| 62.896                         | 0.000 | 3.447 | 4.293           | 744.93              | -0.0069                      | 0.193    |
| 145.173                        | 0.000 | 3.307 | 5.418           | 1202.78             | 0.0015                       | 0.196    |
| 308.653                        | 0.000 | 3.433 | 6.795           | 1906.91             | -0.0051                      | 0.197    |
| 636.240                        | 0.000 | 3.352 | 8.578           | 3055.12             | -0.0012                      | 0.198    |
| 1317.183                       | 0.000 | 3.387 | 10.889          | 4939.84             | -0.0029                      | 0.199    |
| 1326.725                       | 0.000 | 3.341 | 10.918          | 4966.24             | -0.0006                      | 0.199    |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.1159 M ABOVE DISCHARGE PORT

AVG DILUTION = 249.2542 B = 2.57 M

MAXIMUM RISE (CENTER) = 4.0389 M ABOVE DISCHARGE PORT

AVG DILUTION = 395.2737 B = 3.18 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

.....

CASE NO. 5 JETLAG 2000

TITLE Jet5

INPUT PARAMETERS

^^^^^^^^^^^^^^^^^^^^

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500

PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 4.24E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 1.4105 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.5302 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 2.3006 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 26.5258          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 3.7476           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0377           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0231           |
| Fd       | ... | 40.73         | lm/lb | ... | 2.6605           |
| Uj/Ua    | ... | 26.53         | lM/lb | ... | 4.3395           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dmj | ... | 0.0766  |
| lm* | ... | 1.3836  |
| Sm* | ... | 25.5258 |

Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

| X      | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)    | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000  | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 5.305    |
| 0.181  | 0.000 | 0.000 | 0.058           | 1.95                | 7.5024                       | 2.779    |
| 0.548  | 0.000 | 0.001 | 0.111           | 3.86                | 3.7761                       | 1.494    |
| 1.283  | 0.000 | 0.011 | 0.208           | 7.67                | 1.8978                       | 0.849    |
| 2.764  | 0.000 | 0.066 | 0.372           | 15.27               | 0.9506                       | 0.526    |
| 5.311  | 0.000 | 0.289 | 0.631           | 30.48               | 0.4678                       | 0.365    |
| 8.402  | 0.000 | 0.709 | 1.011           | 60.91               | 0.2188                       | 0.285    |
| 12.519 | 0.000 | 1.339 | 1.545           | 121.72              | 0.0868                       | 0.243    |
| 19.177 | 0.000 | 2.242 | 2.287           | 243.08              | 0.0107                       | 0.222    |

NEUTRAL BUOYANCY LEVEL REACHED

|                        |       |       |        |         |         |       |
|------------------------|-------|-------|--------|---------|---------|-------|
| MAXIMUM RISE REACHED   |       |       |        |         |         |       |
| 38.024                 | 0.000 | 3.290 | 3.114  | 429.76  | -0.0335 | 0.212 |
| TRAPPING LEVEL REACHED |       |       |        |         |         |       |
| 84.045                 | 0.000 | 2.703 | 4.150  | 746.15  | -0.0045 | 0.207 |
| 173.522                | 0.000 | 2.579 | 5.325  | 1212.25 | 0.0031  | 0.204 |
| 346.720                | 0.000 | 2.663 | 6.736  | 1925.30 | -0.0013 | 0.203 |
| 685.830                | 0.000 | 2.727 | 8.527  | 3070.36 | -0.0045 | 0.202 |
| 1379.682               | 0.000 | 2.628 | 10.856 | 4961.41 | 0.0003  | 0.201 |
| 2452.842               | 0.000 | 2.706 | 14.306 | 8597.62 | -0.0035 | 0.201 |
| 2463.601               | 0.000 | 2.699 | 14.335 | 8632.45 | -0.0031 | 0.201 |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.4464 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 275.1171 B = 2.45 M

MAXIMUM RISE (CENTER) = 3.2994 M ABOVE DISCHARGE PORT  
AVG DILUTION = 426.4832 B = 3.10 M

1 COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 6 JETLAG 2000  
TITLE Jet6

# INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

# ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

# LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 4.24E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 1.4105 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.5302 (m)       |
| dp/pa    | ... | 0.02883       | lm    | ... | 2.3006 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 26.5258          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 3.7476           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0377           |
| Hor. ang | ... | 180.00        | lQ/lm | ... | 0.0231           |
| Fd       | ... | 40.73         | lm/lb | ... | 2.6605           |
| Uj/Ua    | ... | 26.53         | lm/lb | ... | 4.3395           |

Coflowing case:

dMj ... 0.0766  
lm\* ... 1.3836  
Sm\* ... 25.5258

Stratification case:

T ... -4784.49

| X                              | Y     | Z     | PLUME RADIUS | AVERAGE DILUTION | DENSITY DIFF. (sigmat) | VELOCITY |
|--------------------------------|-------|-------|--------------|------------------|------------------------|----------|
| (m)                            | (m)   | (m)   | (m)          |                  |                        | (m/s)    |
| 0.000                          | 0.000 | 0.000 | 0.030        | 1.00             | 29.6379                | 5.305    |
| -0.175                         | 0.000 | 0.000 | 0.060        | 1.95             | 7.5042                 | 2.582    |
| -0.527                         | 0.000 | 0.002 | 0.124        | 3.86             | 3.7789                 | 1.196    |
| -1.223                         | 0.000 | 0.018 | 0.267        | 7.60             | 1.9160                 | 0.507    |
| -2.508                         | 0.000 | 0.196 | 0.535        | 13.07            | 1.1056                 | 0.218    |
| -3.395                         | 0.000 | 0.677 | 0.970        | 20.33            | 0.6918                 | 0.103    |
| -3.458                         | 0.000 | 0.940 | 1.457        | 33.07            | 0.4155                 | 0.074    |
| -2.848                         | 0.000 | 1.322 | 1.545        | 61.69            | 0.2082                 | 0.123    |
| -0.515                         | 0.000 | 2.053 | 1.909        | 123.21           | 0.0778                 | 0.161    |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |              |                  |                        |          |
| 4.950                          | 0.000 | 3.092 | 2.553        | 245.92           | 0.0012                 | 0.180    |
| MAXIMUM RISE REACHED           |       |       |              |                  |                        |          |
| 23.645                         | 0.000 | 3.909 | 3.258        | 416.44           | -0.0288                | 0.187    |



TRAPPING LEVEL REACHED

|          |       |       |        |         |         |       |
|----------|-------|-------|--------|---------|---------|-------|
| 62.896   | 0.000 | 3.447 | 4.293  | 744.93  | -0.0069 | 0.193 |
| 145.173  | 0.000 | 3.307 | 5.418  | 1202.78 | 0.0015  | 0.196 |
| 308.653  | 0.000 | 3.433 | 6.795  | 1906.91 | -0.0051 | 0.197 |
| 636.240  | 0.000 | 3.352 | 8.578  | 3055.12 | -0.0012 | 0.198 |
| 1317.183 | 0.000 | 3.387 | 10.889 | 4939.84 | -0.0029 | 0.199 |
| 1326.725 | 0.000 | 3.341 | 10.918 | 4966.24 | -0.0006 | 0.199 |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.1159 M ABOVE DISCHARGE PORT

AVG DILUTION = 249.2542 B = 2.57 M

MAXIMUM RISE (CENTER) = 4.0389 M ABOVE DISCHARGE PORT

AVG DILUTION = 395.2737 B = 3.18 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

.....

CASE NO. 7 JETLAG 2000

TITLE Jet7

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC

SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)

COFLOW FACTOR : STANDARD

TIME STEP CONTRL : VARIABLE ( > 0.985 )

MAX NUMBER OF TIME STEPS : 1500

PRINTOUT INTERVAL : 100

MAX NUMBER OF ITERATIONS : 5

ITERATION ERROR BOUND : 0.00100

APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj    | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 4.24E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | lm    | ... 1.4105 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.5302 (m)       |
| dp/pa    | ... 0.02883       | lm    | ... 2.3006 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 26.5258          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 3.7476           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0377           |
| Hor. ang | ... 0.00          | lQ/lM | ... 0.0231           |
| Fd       | ... 40.73         | lm/lb | ... 2.6605           |
| Uj/Ua    | ... 26.53         | lM/lb | ... 4.3395           |

Coflowing case:

dmj ... 0.0766

lm\* ... 1.3836

Sm\* ... 25.5258

Stratification case:

T ... -4784.49

| X     | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|-------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)   | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000 | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 5.305             |
| 0.181 | 0.000 | 0.000 | 0.058           | 1.95                | 7.5024                       | 2.779             |

|        |       |       |       |        |        |       |
|--------|-------|-------|-------|--------|--------|-------|
| 0.548  | 0.000 | 0.001 | 0.111 | 3.86   | 3.7761 | 1.494 |
| 1.283  | 0.000 | 0.011 | 0.208 | 7.67   | 1.8978 | 0.849 |
| 2.764  | 0.000 | 0.066 | 0.372 | 15.27  | 0.9506 | 0.526 |
| 5.311  | 0.000 | 0.289 | 0.631 | 30.48  | 0.4678 | 0.365 |
| 8.402  | 0.000 | 0.709 | 1.011 | 60.91  | 0.2188 | 0.285 |
| 12.519 | 0.000 | 1.339 | 1.545 | 121.72 | 0.0868 | 0.243 |
| 19.177 | 0.000 | 2.242 | 2.287 | 243.08 | 0.0107 | 0.222 |

NEUTRAL BUOYANCY LEVEL REACHED

MAXIMUM RISE REACHED

|        |       |       |       |        |         |       |
|--------|-------|-------|-------|--------|---------|-------|
| 38.024 | 0.000 | 3.290 | 3.114 | 429.76 | -0.0335 | 0.212 |
|--------|-------|-------|-------|--------|---------|-------|

TRAPPING LEVEL REACHED

|          |       |       |        |         |         |       |
|----------|-------|-------|--------|---------|---------|-------|
| 84.045   | 0.000 | 2.703 | 4.150  | 746.15  | -0.0045 | 0.207 |
| 173.522  | 0.000 | 2.579 | 5.325  | 1212.25 | 0.0031  | 0.204 |
| 346.720  | 0.000 | 2.663 | 6.736  | 1925.30 | -0.0013 | 0.203 |
| 685.830  | 0.000 | 2.727 | 8.527  | 3070.36 | -0.0045 | 0.202 |
| 1379.682 | 0.000 | 2.628 | 10.856 | 4961.41 | 0.0003  | 0.201 |
| 2452.842 | 0.000 | 2.706 | 14.306 | 8597.62 | -0.0035 | 0.201 |
| 2463.601 | 0.000 | 2.699 | 14.335 | 8632.45 | -0.0031 | 0.201 |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.4464 M ABOVE DISCHARGE PORT

AVG DILUTION = 275.1171 B = 2.45 M

MAXIMUM RISE (CENTER) = 3.2994 M ABOVE DISCHARGE PORT

AVG DILUTION = 426.4832 B = 3.10 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

..... JETLAG 2000

CASE NO. 8

TITLE Jet8

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |                        |
|----------------------------|------------------------|
| ENTRAINMENT HYPOTHESIS     | : ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : STANDARD             |
| TIME STEP CONTRL           | : VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : 1500                 |
| PRINTOUT INTERVAL          | : 100                  |
| MAX NUMBER OF ITERATIONS   | : 5                    |
| ITERATION ERROR BOUND      | : 0.00100              |
| APPROX RATIO OF MASS/DMASS | : 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         |          |       |       |        |        |
|---------|----------|-------|-------|--------|--------|
|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj    | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 4.24E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | lm    | ... 1.4105 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.5302 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 2.3006 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 26.5258          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 3.7476           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0377           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0231           |
| Fd       | ... 40.73         | lm/lb | ... 2.6605           |
| Uj/Ua    | ... 26.53         | lM/lb | ... 4.3395           |

Coflowing case:

|     |             |
|-----|-------------|
| dMj | ... 0.0766  |
| lm* | ... 1.3836  |
| Sm* | ... 25.5258 |

Stratification case:

T ... -4784.49

| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 5.305             |
| -0.175                         | 0.000    | 0.000    | 0.060                  | 1.95                | 7.5042                       | 2.582             |
| -0.527                         | 0.000    | 0.002    | 0.124                  | 3.86                | 3.7789                       | 1.196             |
| -1.223                         | 0.000    | 0.018    | 0.267                  | 7.60                | 1.9160                       | 0.507             |
| -2.508                         | 0.000    | 0.196    | 0.535                  | 13.07               | 1.1056                       | 0.218             |
| -3.395                         | 0.000    | 0.677    | 0.970                  | 20.33               | 0.6918                       | 0.103             |
| -3.458                         | 0.000    | 0.940    | 1.457                  | 33.07               | 0.4155                       | 0.074             |
| -2.848                         | 0.000    | 1.322    | 1.545                  | 61.69               | 0.2082                       | 0.123             |
| -0.515                         | 0.000    | 2.053    | 1.909                  | 123.21              | 0.0778                       | 0.161             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| 4.950                          | 0.000    | 3.092    | 2.553                  | 245.92              | 0.0012                       | 0.180             |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| 23.645                         | 0.000    | 3.909    | 3.258                  | 416.44              | -0.0288                      | 0.187             |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 62.896                         | 0.000    | 3.447    | 4.293                  | 744.93              | -0.0069                      | 0.193             |
| 145.173                        | 0.000    | 3.307    | 5.418                  | 1202.78             | 0.0015                       | 0.196             |
| 308.653                        | 0.000    | 3.433    | 6.795                  | 1906.91             | -0.0051                      | 0.197             |
| 636.240                        | 0.000    | 3.352    | 8.578                  | 3055.12             | -0.0012                      | 0.198             |
| 1317.183                       | 0.000    | 3.387    | 10.889                 | 4939.84             | -0.0029                      | 0.199             |
| 1326.725                       | 0.000    | 3.341    | 10.918                 | 4966.24             | -0.0006                      | 0.199             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.1159 M ABOVE DISCHARGE PORT

AVG DILUTION = 249.2542 B = 2.57 M

MAXIMUM RISE (CENTER) = 4.0389 M ABOVE DISCHARGE PORT

AVG DILUTION = 395.2737 B = 3.18 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 9 JETLAG 2000  
TITLE Jet9

INPUT PARAMETERS  
^^^^^^^^^^^^^^^^^^^^

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES  
^^^^^^^^^^^^^^^^^^^^

|              |               |           |                  |
|--------------|---------------|-----------|------------------|
| Total Q ...  | 0.0150 (m3/s) | Qj ...    | 1.50E-02 (m3/s)  |
| Port No. ... | 1             | Mj ...    | 7.96E-02 (m4/s2) |
| Depth ...    | 29.3000 (m)   | Bj ...    | 4.24E-03 (m4/s3) |
| Diameter ... | 0.0600 (m)    | lQ ...    | 0.0532 (m)       |
| Uj ...       | 5.3052 (m/s)  | lm ...    | 1.4105 (m)       |
| Ua ...       | 0.2000 (m/s)  | lb ...    | 0.5302 (m)       |
| dp/pa ...    | 0.02883       | lm ...    | 2.3006 (m)       |
| po ...       | 0.99827(g/cc) | Sm ...    | 26.5258          |
| pa ...       | 1.02790(g/cc) | Sb ...    | 3.7476           |
| Ver. ang ... | 0.00          | lQ/lm ... | 0.0377           |

Hor. ang ... 0.00  
Fd ... 40.73  
Uj/Ua ... 26.53

lq/lm ... 0.0231  
lm/lb ... 2.6605  
lM/lb ... 4.3395

Coflowing case:

dMj ... 0.0766  
lm\* ... 1.3836  
sm\* ... 25.5258

Stratification case:

T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 5.305    |
| 0.181                          | 0.000 | 0.000 | 0.058           | 1.95                | 7.5024                       | 2.779    |
| 0.548                          | 0.000 | 0.001 | 0.111           | 3.86                | 3.7761                       | 1.494    |
| 1.283                          | 0.000 | 0.011 | 0.208           | 7.67                | 1.8978                       | 0.849    |
| 2.764                          | 0.000 | 0.066 | 0.372           | 15.27               | 0.9506                       | 0.526    |
| 5.311                          | 0.000 | 0.289 | 0.631           | 30.48               | 0.4678                       | 0.365    |
| 8.402                          | 0.000 | 0.709 | 1.011           | 60.91               | 0.2188                       | 0.285    |
| 12.519                         | 0.000 | 1.339 | 1.545           | 121.72              | 0.0868                       | 0.243    |
| 19.177                         | 0.000 | 2.242 | 2.287           | 243.08              | 0.0107                       | 0.222    |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |          |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |          |
| 38.024                         | 0.000 | 3.290 | 3.114           | 429.76              | -0.0335                      | 0.212    |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |          |
| 84.045                         | 0.000 | 2.703 | 4.150           | 746.15              | -0.0045                      | 0.207    |
| 173.522                        | 0.000 | 2.579 | 5.325           | 1212.25             | 0.0031                       | 0.204    |
| 346.720                        | 0.000 | 2.663 | 6.736           | 1925.30             | -0.0013                      | 0.203    |
| 685.830                        | 0.000 | 2.727 | 8.527           | 3070.36             | -0.0045                      | 0.202    |
| 1379.682                       | 0.000 | 2.628 | 10.856          | 4961.41             | 0.0003                       | 0.201    |
| 2452.842                       | 0.000 | 2.706 | 14.306          | 8597.62             | -0.0035                      | 0.201    |
| 2463.601                       | 0.000 | 2.699 | 14.335          | 8632.45             | -0.0031                      | 0.201    |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.4464 M ABOVE DISCHARGE PORT

AVG DILUTION = 275.1171 B = 2.45 M

MAXIMUM RISE (CENTER) = 3.2994 M ABOVE DISCHARGE PORT

AVG DILUTION = 426.4832 B = 3.10 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 10 JETLAG 2000  
TITLE Jet10

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 4.24E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 1.4105 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.5302 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 2.3006 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 26.5258          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 3.7476           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0377           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0231           |
| Fd       | ... | 40.73         | lm/lb | ... | 2.6605           |
| Uj/Ua    | ... | 26.53         | lM/lb | ... | 4.3395           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0766  |
| lm* | ... | 1.3836  |
| sm* | ... | 25.5258 |

Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 5.305             |
| -0.175                         | 0.000 | 0.000 | 0.060           | 1.95                | 7.5042                       | 2.582             |
| -0.527                         | 0.000 | 0.002 | 0.124           | 3.86                | 3.7789                       | 1.196             |
| -1.223                         | 0.000 | 0.018 | 0.267           | 7.60                | 1.9160                       | 0.507             |
| -2.508                         | 0.000 | 0.196 | 0.535           | 13.07               | 1.1056                       | 0.218             |
| -3.395                         | 0.000 | 0.677 | 0.970           | 20.33               | 0.6918                       | 0.103             |
| -3.458                         | 0.000 | 0.940 | 1.457           | 33.07               | 0.4155                       | 0.074             |
| -2.848                         | 0.000 | 1.322 | 1.545           | 61.69               | 0.2082                       | 0.123             |
| -0.515                         | 0.000 | 2.053 | 1.909           | 123.21              | 0.0778                       | 0.161             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| 4.950                          | 0.000 | 3.092 | 2.553           | 245.92              | 0.0012                       | 0.180             |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |                   |
| 23.645                         | 0.000 | 3.909 | 3.258           | 416.44              | -0.0288                      | 0.187             |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |                   |
| 62.896                         | 0.000 | 3.447 | 4.293           | 744.93              | -0.0069                      | 0.193             |
| 145.173                        | 0.000 | 3.307 | 5.418           | 1202.78             | 0.0015                       | 0.196             |
| 308.653                        | 0.000 | 3.433 | 6.795           | 1906.91             | -0.0051                      | 0.197             |
| 636.240                        | 0.000 | 3.352 | 8.578           | 3055.12             | -0.0012                      | 0.198             |
| 1317.183                       | 0.000 | 3.387 | 10.889          | 4939.84             | -0.0029                      | 0.199             |
| 1326.725                       | 0.000 | 3.341 | 10.918          | 4966.24             | -0.0006                      | 0.199             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.1159 M ABOVE DISCHARGE PORT

AVG DILUTION = 249.2542 B = 2.57 M

MAXIMUM RISE (CENTER) = 4.0389 M ABOVE DISCHARGE PORT

AVG DILUTION = 395.2737 B = 3.18 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

## **SIMULACIÓN 6**

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 1 JETLAG 2000

TITLE Jet1

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                          |   |                      |
|--------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS   | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT        | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR            | : | STANDARD             |
| TIME STEP CONTRL         | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS | : | 1500                 |

PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| .....   | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
| AMBIENT | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.66E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.7069 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 3.0675 (m)       |
| po       | ... | 0.99827(g/cc) | sm    | ... | 35.3678          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 4.9968           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 90.00         | lQ/lM | ... | 0.0173           |
| Fd       | ... | 54.31         | lm/lb | ... | 2.6605           |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 4.3395           |

Stratification case:  
 T ... -4784.49

| X                              | Y      | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|--------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)    | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000  | 0.000 | 0.030           | 1.00                | 29.6379                      | 7.074             |
| 0.002                          | 0.179  | 0.000 | 0.059           | 1.94                | 7.5311                       | 3.588             |
| 0.022                          | 0.543  | 0.001 | 0.116           | 3.84                | 3.7960                       | 1.808             |
| 0.099                          | 1.112  | 0.005 | 0.230           | 7.64                | 1.9064                       | 0.920             |
| 0.302                          | 1.808  | 0.022 | 0.445           | 15.23               | 0.9550                       | 0.490             |
| 0.734                          | 2.516  | 0.061 | 0.805           | 30.39               | 0.4768                       | 0.298             |
| 1.556                          | 3.176  | 0.139 | 1.302           | 60.65               | 0.2360                       | 0.228             |
| 3.654                          | 3.994  | 0.350 | 1.926           | 120.85              | 0.1105                       | 0.207             |
| 9.168                          | 5.077  | 0.971 | 2.753           | 241.02              | 0.0323                       | 0.202             |
| NEUTRAL BUOYANCY LEVEL REACHED |        |       |                 |                     |                              |                   |
| 22.978                         | 6.418  | 2.106 | 3.905           | 479.76              | -0.0244                      | 0.200             |
| MAXIMUM RISE REACHED           |        |       |                 |                     |                              |                   |
| TRAPPING LEVEL REACHED         |        |       |                 |                     |                              |                   |
| 64.720                         | 8.499  | 1.465 | 5.436           | 928.15              | 0.0116                       | 0.200             |
| 168.150                        | 11.178 | 1.582 | 7.503           | 1768.11             | 0.0066                       | 0.200             |
| 427.623                        | 14.769 | 1.758 | 10.228          | 3285.63             | -0.0022                      | 0.200             |
| 1086.123                       | 19.657 | 1.680 | 13.968          | 6128.65             | 0.0016                       | 0.200             |
| 2210.056                       | 24.356 | 1.802 | 18.879          | 11196.26            | -0.0043                      | 0.200             |
| 3296.665                       | 26.923 | 1.742 | 24.849          | 19399.48            | -0.0013                      | 0.200             |
| 3307.281                       | 26.941 | 1.841 | 24.919          | 19506.50            | -0.0062                      | 0.200             |

NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 1.5174 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 342.2617 B = 3.29 M  
 MAXIMUM RISE (CENTER) = 2.2209 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 547.7349 B = 4.18 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 2 JETLAG 2000  
 TITLE Jet2

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^^^^^^^^^

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

# ENVIROMENTAL CONDITIONS

^^  
 DEPTH(m) S T(C) SIGMAT U(m/s)  
 EXIT 29.30 0.00 20.00 -1.73 7.074  
 .....  
 AMBIENT 0.00 37.00 25.00 24.88 0.200  
 30.00 38.50 18.00 27.97 0.200

# LENGTH & DILUTION SCALES

^^  
 Total Q ... 0.0200 (m3/s) Qj ... 2.00E-02 (m3/s)  
 Port No. ... 1 Mj ... 1.41E-01 (m4/s2)  
 Depth ... 29.3000 (m) Bj ... 5.66E-03 (m4/s3)  
 Diameter ... 0.0600 (m) lQ ... 0.0532 (m)  
 Uj ... 7.0736 (m/s) lm ... 1.8806 (m)  
 Ua ... 0.2000 (m/s) lb ... 0.7069 (m)  
 dp/pa ... 0.02883 lm ... 3.0675 (m)  
 po ... 0.99827(g/cc) Sm ... 35.3678  
 pa ... 1.02790(g/cc) Sb ... 4.9968  
 Ver. ang ... 0.00 lQ/lm ... 0.0283  
 Hor. ang ... 180.00 lQ/lm ... 0.0173  
 Fd ... 54.31 lm/lb ... 2.6605  
 Uj/Ua ... 35.37 lm/lb ... 4.3395

Stratification case:  
 T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 7.074             |
| -0.175                         | 0.000 | 0.000 | 0.060           | 1.95                | 7.5040                       | 3.475             |
| -0.529                         | 0.000 | 0.001 | 0.122           | 3.86                | 3.7785                       | 1.644             |
| -1.236                         | 0.000 | 0.009 | 0.259           | 7.65                | 1.9031                       | 0.727             |
| -2.564                         | 0.000 | 0.097 | 0.559           | 14.42               | 1.0055                       | 0.293             |
| -4.346                         | 0.000 | 0.694 | 1.038           | 22.90               | 0.6089                       | 0.135             |
| -4.676                         | 0.000 | 1.137 | 1.683           | 33.86               | 0.3941                       | 0.076             |
| -4.367                         | 0.000 | 1.499 | 1.979           | 62.61               | 0.1994                       | 0.102             |
| -2.271                         | 0.000 | 2.292 | 2.300           | 123.38              | 0.0720                       | 0.149             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| 3.406                          | 0.000 | 3.466 | 3.008           | 246.20              | -0.0066                      | 0.173             |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |                   |
| 24.088                         | 0.000 | 3.949 | 3.804           | 417.17              | -0.0174                      | 0.184             |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |                   |
| 65.868                         | 0.000 | 3.924 | 4.940           | 729.75              | -0.0185                      | 0.190             |
| 155.175                        | 0.000 | 3.310 | 6.167           | 1158.53             | 0.0122                       | 0.194             |
| 334.327                        | 0.000 | 3.506 | 7.765           | 1858.27             | 0.0024                       | 0.196             |
| 694.819                        | 0.000 | 3.649 | 9.793           | 2977.26             | -0.0045                      | 0.198             |
| 1453.027                       | 0.000 | 3.504 | 12.472          | 4851.61             | 0.0026                       | 0.199             |
| 1464.459                       | 0.000 | 3.491 | 12.503          | 4875.27             | 0.0032                       | 0.199             |

NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 3.3273 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 229.4070 B = 2.92 M  
 MAXIMUM RISE (CENTER) = 4.3286 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 364.2120 B = 3.58 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)  
 1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....

CASE NO. 3  
TITLE Jet3

JETLAG 2000

INPUT PARAMETERS  
^^^^^^^^^^^^^^^^^^^^

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES  
^^^^^^^^^^^^^^^^^^^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.66E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.7069 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 3.0675 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 4.9968           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0173           |
| Fd       | ... | 54.31         | lm/lb | ... | 2.6605           |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 4.3395           |

Coflowing case:

dMj ... 0.1375  
lm\* ... 1.8539  
Sm\* ... 34.3678

Stratification case:

T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 7.074             |
| 0.180                          | 0.000 | 0.000 | 0.058           | 1.95                | 7.5026                       | 3.672             |
| 0.545                          | 0.000 | 0.001 | 0.112           | 3.86                | 3.7764                       | 1.942             |
| 1.275                          | 0.000 | 0.006 | 0.213           | 7.67                | 1.8983                       | 1.074             |
| 2.742                          | 0.000 | 0.041 | 0.390           | 15.26               | 0.9518                       | 0.639             |
| 5.640                          | 0.000 | 0.227 | 0.678           | 30.44               | 0.4701                       | 0.421             |
| 9.444                          | 0.000 | 0.672 | 1.113           | 60.83               | 0.2190                       | 0.313             |
| 14.335                         | 0.000 | 1.387 | 1.733           | 121.56              | 0.0837                       | 0.258             |
| 22.014                         | 0.000 | 2.419 | 2.598           | 242.74              | 0.0045                       | 0.229             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| 44.235                         | 0.000 | 3.315 | 3.519           | 420.30              | -0.0295                      | 0.216             |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |                   |
| 96.046                         | 0.000 | 3.078 | 4.753           | 741.70              | -0.0180                      | 0.209             |
| 198.031                        | 0.000 | 2.545 | 6.025           | 1173.18             | 0.0084                       | 0.206             |
| 393.307                        | 0.000 | 2.853 | 7.712           | 1901.45             | -0.0067                      | 0.204             |
| 778.127                        | 0.000 | 2.653 | 9.755           | 3022.90             | 0.0033                       | 0.202             |
| 1572.414                       | 0.000 | 2.768 | 12.464          | 4914.13             | -0.0025                      | 0.201             |
| 2647.299                       | 0.000 | 2.744 | 16.281          | 8361.26             | -0.0012                      | 0.201             |
| 2657.920                       | 0.000 | 2.804 | 16.322          | 8402.68             | -0.0042                      | 0.201             |



NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 2.5078 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 254.8097 B = 2.67 M  
 MAXIMUM RISE (CENTER) = 3.4240 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 402.7245 B = 3.44 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 4 JETLAG 2000  
 TITLE Jet4

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^^^^^

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^^^^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.66E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| uj       | ... | 7.0736 (m/s)  | lm    | ... | 1.8806 (m)       |
| ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.7069 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 3.0675 (m)       |
| po       | ... | 0.99827(g/cc) | sm    | ... | 35.3678          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 4.9968           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0173           |
| Fd       | ... | 54.31         | lm/lb | ... | 2.6605           |
| uj/ua    | ... | 35.37         | lM/lb | ... | 4.3395           |

Coflowing case:

dMj ... 0.1375  
 lm\* ... 1.8539  
 sm\* ... 34.3678

Stratification case:

T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 7.074             |
| -0.175                         | 0.000 | 0.000 | 0.060           | 1.95                | 7.5040                       | 3.475             |
| -0.529                         | 0.000 | 0.001 | 0.122           | 3.86                | 3.7785                       | 1.644             |
| -1.236                         | 0.000 | 0.009 | 0.259           | 7.65                | 1.9031                       | 0.727             |
| -2.564                         | 0.000 | 0.097 | 0.559           | 14.42               | 1.0055                       | 0.293             |
| -4.346                         | 0.000 | 0.694 | 1.038           | 22.90               | 0.6089                       | 0.135             |
| -4.676                         | 0.000 | 1.137 | 1.683           | 33.86               | 0.3941                       | 0.076             |
| -4.367                         | 0.000 | 1.499 | 1.979           | 62.61               | 0.1994                       | 0.102             |
| -2.271                         | 0.000 | 2.292 | 2.300           | 123.38              | 0.0720                       | 0.149             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| 3.406                          | 0.000 | 3.466 | 3.008           | 246.20              | -0.0066                      | 0.173             |

|                        |       |       |        |         |         |       |
|------------------------|-------|-------|--------|---------|---------|-------|
| MAXIMUM RISE REACHED   |       |       |        |         |         |       |
| 24.088                 | 0.000 | 3.949 | 3.804  | 417.17  | -0.0174 | 0.184 |
| TRAPPING LEVEL REACHED |       |       |        |         |         |       |
| 65.868                 | 0.000 | 3.924 | 4.940  | 729.75  | -0.0185 | 0.190 |
| 155.175                | 0.000 | 3.310 | 6.167  | 1158.53 | 0.0122  | 0.194 |
| 334.327                | 0.000 | 3.506 | 7.765  | 1858.27 | 0.0024  | 0.196 |
| 694.819                | 0.000 | 3.649 | 9.793  | 2977.26 | -0.0045 | 0.198 |
| 1453.027               | 0.000 | 3.504 | 12.472 | 4851.61 | 0.0026  | 0.199 |
| 1464.459               | 0.000 | 3.491 | 12.503 | 4875.27 | 0.0032  | 0.199 |

NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 3.3273 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 229.4070 B = 2.92 M  
 MAXIMUM RISE (CENTER) = 4.3286 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 364.2120 B = 3.58 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 5 JETLAG 2000  
 TITLE Jet5

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^  

|         |          |       |       |        |        |
|---------|----------|-------|-------|--------|--------|
|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^  

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.66E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.7069 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 3.0675 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 4.9968           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0173           |
| Fd       | ... | 54.31         | lm/lb | ... | 2.6605           |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 4.3395           |

Coflowing case:  
 dMj ... 0.1375  
 lm\* ... 1.8539  
 Sm\* ... 34.3678

Stratification case:  
 T ... -4784.49

|       |       |       |                 |                     |                              |                   |
|-------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| X     | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
| (m)   | (m)   | (m)   | (m)             |                     |                              |                   |
| ..... | ..... | ..... | .....           | .....               | .....                        | .....             |

|        |       |       |       |        |         |       |
|--------|-------|-------|-------|--------|---------|-------|
| 0.000  | 0.000 | 0.000 | 0.030 | 1.00   | 29.6379 | 7.074 |
| 0.180  | 0.000 | 0.000 | 0.058 | 1.95   | 7.5026  | 3.672 |
| 0.545  | 0.000 | 0.001 | 0.112 | 3.86   | 3.7764  | 1.942 |
| 1.275  | 0.000 | 0.006 | 0.213 | 7.67   | 1.8983  | 1.074 |
| 2.742  | 0.000 | 0.041 | 0.390 | 15.26  | 0.9518  | 0.639 |
| 5.640  | 0.000 | 0.227 | 0.678 | 30.44  | 0.4701  | 0.421 |
| 9.444  | 0.000 | 0.672 | 1.113 | 60.83  | 0.2190  | 0.313 |
| 14.335 | 0.000 | 1.387 | 1.733 | 121.56 | 0.0837  | 0.258 |
| 22.014 | 0.000 | 2.419 | 2.598 | 242.74 | 0.0045  | 0.229 |

NEUTRAL BUOYANCY LEVEL REACHED

MAXIMUM RISE REACHED

|        |       |       |       |        |         |       |
|--------|-------|-------|-------|--------|---------|-------|
| 44.235 | 0.000 | 3.315 | 3.519 | 420.30 | -0.0295 | 0.216 |
|--------|-------|-------|-------|--------|---------|-------|

TRAPPING LEVEL REACHED

|          |       |       |        |         |         |       |
|----------|-------|-------|--------|---------|---------|-------|
| 96.046   | 0.000 | 3.078 | 4.753  | 741.70  | -0.0180 | 0.209 |
| 198.031  | 0.000 | 2.545 | 6.025  | 1173.18 | 0.0084  | 0.206 |
| 393.307  | 0.000 | 2.853 | 7.712  | 1901.45 | -0.0067 | 0.204 |
| 778.127  | 0.000 | 2.653 | 9.755  | 3022.90 | 0.0033  | 0.202 |
| 1572.414 | 0.000 | 2.768 | 12.464 | 4914.13 | -0.0025 | 0.201 |
| 2647.299 | 0.000 | 2.744 | 16.281 | 8361.26 | -0.0012 | 0.201 |
| 2657.920 | 0.000 | 2.804 | 16.322 | 8402.68 | -0.0042 | 0.201 |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.5078 M ABOVE DISCHARGE PORT

AVG DILUTION = 254.8097 B = 2.67 M

MAXIMUM RISE (CENTER) = 3.4240 M ABOVE DISCHARGE PORT

AVG DILUTION = 402.7245 B = 3.44 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 6 JETLAG 2000  
TITLE Jet6

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.66E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.7069 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 3.0675 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 4.9968           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0173           |
| Fd       | ... | 54.31         | lm/lb | ... | 2.6605           |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 4.3395           |

Coflowing case:

|     |     |        |
|-----|-----|--------|
| dMj | ... | 0.1375 |
| lm* | ... | 1.8539 |

Sm\* ... 34.3678

Stratification case:  
T ... -4784.49

| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 7.074             |
| -0.175                         | 0.000    | 0.000    | 0.060                  | 1.95                | 7.5040                       | 3.475             |
| -0.529                         | 0.000    | 0.001    | 0.122                  | 3.86                | 3.7785                       | 1.644             |
| -1.236                         | 0.000    | 0.009    | 0.259                  | 7.65                | 1.9031                       | 0.727             |
| -2.564                         | 0.000    | 0.097    | 0.559                  | 14.42               | 1.0055                       | 0.293             |
| -4.346                         | 0.000    | 0.694    | 1.038                  | 22.90               | 0.6089                       | 0.135             |
| -4.676                         | 0.000    | 1.137    | 1.683                  | 33.86               | 0.3941                       | 0.076             |
| -4.367                         | 0.000    | 1.499    | 1.979                  | 62.61               | 0.1994                       | 0.102             |
| -2.271                         | 0.000    | 2.292    | 2.300                  | 123.38              | 0.0720                       | 0.149             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| 3.406                          | 0.000    | 3.466    | 3.008                  | 246.20              | -0.0066                      | 0.173             |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| 24.088                         | 0.000    | 3.949    | 3.804                  | 417.17              | -0.0174                      | 0.184             |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 65.868                         | 0.000    | 3.924    | 4.940                  | 729.75              | -0.0185                      | 0.190             |
| 155.175                        | 0.000    | 3.310    | 6.167                  | 1158.53             | 0.0122                       | 0.194             |
| 334.327                        | 0.000    | 3.506    | 7.765                  | 1858.27             | 0.0024                       | 0.196             |
| 694.819                        | 0.000    | 3.649    | 9.793                  | 2977.26             | -0.0045                      | 0.198             |
| 1453.027                       | 0.000    | 3.504    | 12.472                 | 4851.61             | 0.0026                       | 0.199             |
| 1464.459                       | 0.000    | 3.491    | 12.503                 | 4875.27             | 0.0032                       | 0.199             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.3273 M ABOVE DISCHARGE PORT

AVG DILUTION = 229.4070 B = 2.92 M

MAXIMUM RISE (CENTER) = 4.3286 M ABOVE DISCHARGE PORT

AVG DILUTION = 364.2120 B = 3.58 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 7 JETLAG 2000

TITLE Jet7

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |    |                      |
|----------|-------------------|----|----------------------|
| Total Q  | ... 0.0200 (m3/s) | Qj | ... 2.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj | ... 1.41E-01 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj | ... 5.66E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ | ... 0.0532 (m)       |
| Uj       | ... 7.0736 (m/s)  | lm | ... 1.8806 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb | ... 0.7069 (m)       |

```

dp/pa    ...    0.02883          lM ...    3.0675 (m)
po       ...    0.99827(g/cc)     Sm ...    35.3678
pa       ...    1.02790(g/cc)     Sb ...    4.9968
ver. ang ...    0.00             lQ/lm ...    0.0283
Hor. ang ...    0.00             lQ/lm ...    0.0173
Fd       ...    54.31             lm/lb ...    2.6605
Uj/Ua    ...    35.37             lm/lb ...    4.3395

```

Coflowing case:

```

dMj     ...    0.1375
lm*      ...    1.8539
Sm*      ...    34.3678

```

Stratification case:

```

T       ... -4784.49

```

| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 7.074             |
| 0.180                          | 0.000    | 0.000    | 0.058                  | 1.95                | 7.5026                       | 3.672             |
| 0.545                          | 0.000    | 0.001    | 0.112                  | 3.86                | 3.7764                       | 1.942             |
| 1.275                          | 0.000    | 0.006    | 0.213                  | 7.67                | 1.8983                       | 1.074             |
| 2.742                          | 0.000    | 0.041    | 0.390                  | 15.26               | 0.9518                       | 0.639             |
| 5.640                          | 0.000    | 0.227    | 0.678                  | 30.44               | 0.4701                       | 0.421             |
| 9.444                          | 0.000    | 0.672    | 1.113                  | 60.83               | 0.2190                       | 0.313             |
| 14.335                         | 0.000    | 1.387    | 1.733                  | 121.56              | 0.0837                       | 0.258             |
| 22.014                         | 0.000    | 2.419    | 2.598                  | 242.74              | 0.0045                       | 0.229             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| 44.235                         | 0.000    | 3.315    | 3.519                  | 420.30              | -0.0295                      | 0.216             |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 96.046                         | 0.000    | 3.078    | 4.753                  | 741.70              | -0.0180                      | 0.209             |
| 198.031                        | 0.000    | 2.545    | 6.025                  | 1173.18             | 0.0084                       | 0.206             |
| 393.307                        | 0.000    | 2.853    | 7.712                  | 1901.45             | -0.0067                      | 0.204             |
| 778.127                        | 0.000    | 2.653    | 9.755                  | 3022.90             | 0.0033                       | 0.202             |
| 1572.414                       | 0.000    | 2.768    | 12.464                 | 4914.13             | -0.0025                      | 0.201             |
| 2647.299                       | 0.000    | 2.744    | 16.281                 | 8361.26             | -0.0012                      | 0.201             |
| 2657.920                       | 0.000    | 2.804    | 16.322                 | 8402.68             | -0.0042                      | 0.201             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.5078 M ABOVE DISCHARGE PORT

AVG DILUTION = 254.8097 B = 2.67 M

MAXIMUM RISE (CENTER) = 3.4240 M ABOVE DISCHARGE PORT

AVG DILUTION = 402.7245 B = 3.44 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 8 JETLAG 2000

TITLE Jet8

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

```

ENTRAINMENT HYPOTHESIS : ASYMMETRIC
SHEAR ENTRAINMENT      : VARIABLE (0 - 0.085)
COFLOW FACTOR          : STANDARD
TIME STEP CONTRL       : VARIABLE ( > 0.985 )
MAX NUMBER OF TIME STEPS : 1500
PRINTOUT INTERVAL      : 100
MAX NUMBER OF ITERATIONS : 5
ITERATION ERROR BOUND   : 0.00100
APPROX RATIO OF MASS/DMASS : 144.0

```

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |

30.00 38.50 18.00 27.97 0.200

# LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.66E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.7069 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 3.0675 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 4.9968           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0173           |
| Fd       | ... | 54.31         | lm/lb | ... | 2.6605           |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 4.3395           |

## Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.1375  |
| lm* | ... | 1.8539  |
| Sm* | ... | 34.3678 |

## Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 7.074             |
| -0.175                         | 0.000 | 0.000 | 0.060           | 1.95                | 7.5040                       | 3.475             |
| -0.529                         | 0.000 | 0.001 | 0.122           | 3.86                | 3.7785                       | 1.644             |
| -1.236                         | 0.000 | 0.009 | 0.259           | 7.65                | 1.9031                       | 0.727             |
| -2.564                         | 0.000 | 0.097 | 0.559           | 14.42               | 1.0055                       | 0.293             |
| -4.346                         | 0.000 | 0.694 | 1.038           | 22.90               | 0.6089                       | 0.135             |
| -4.676                         | 0.000 | 1.137 | 1.683           | 33.86               | 0.3941                       | 0.076             |
| -4.367                         | 0.000 | 1.499 | 1.979           | 62.61               | 0.1994                       | 0.102             |
| -2.271                         | 0.000 | 2.292 | 2.300           | 123.38              | 0.0720                       | 0.149             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| 3.406                          | 0.000 | 3.466 | 3.008           | 246.20              | -0.0066                      | 0.173             |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |                   |
| 24.088                         | 0.000 | 3.949 | 3.804           | 417.17              | -0.0174                      | 0.184             |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |                   |
| 65.868                         | 0.000 | 3.924 | 4.940           | 729.75              | -0.0185                      | 0.190             |
| 155.175                        | 0.000 | 3.310 | 6.167           | 1158.53             | 0.0122                       | 0.194             |
| 334.327                        | 0.000 | 3.506 | 7.765           | 1858.27             | 0.0024                       | 0.196             |
| 694.819                        | 0.000 | 3.649 | 9.793           | 2977.26             | -0.0045                      | 0.198             |
| 1453.027                       | 0.000 | 3.504 | 12.472          | 4851.61             | 0.0026                       | 0.199             |
| 1464.459                       | 0.000 | 3.491 | 12.503          | 4875.27             | 0.0032                       | 0.199             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.3273 M ABOVE DISCHARGE PORT

AVG DILUTION = 229.4070 B = 2.92 M

MAXIMUM RISE (CENTER) = 4.3286 M ABOVE DISCHARGE PORT

AVG DILUTION = 364.2120 B = 3.58 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

.....

CASE NO. 9 JETLAG 2000

TITLE Jet9

## INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                          |   |                      |
|--------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS   | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT        | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR            | : | STANDARD             |
| TIME STEP CONTRL         | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS | : | 1500                 |
| PRINTOUT INTERVAL        | : | 100                  |

MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

^^  
 DEPTH(m) S T(C) SIGMAT U(m/s)  
 EXIT 29.30 0.00 20.00 -1.73 7.074  
 .....  
 AMBIENT 0.00 37.00 25.00 24.88 0.200  
 30.00 38.50 18.00 27.97 0.200

LENGTH & DILUTION SCALES

^^  
 Total Q ... 0.0200 (m3/s) Qj ... 2.00E-02 (m3/s)  
 Port No. ... 1 Mj ... 1.41E-01 (m4/s2)  
 Depth ... 29.3000 (m) Bj ... 5.66E-03 (m4/s3)  
 Diameter ... 0.0600 (m) lQ ... 0.0532 (m)  
 Uj ... 7.0736 (m/s) lm ... 1.8806 (m)  
 Ua ... 0.2000 (m/s) lb ... 0.7069 (m)  
 dp/pa ... 0.02883 lM ... 3.0675 (m)  
 po ... 0.99827(g/cc) Sm ... 35.3678  
 pa ... 1.02790(g/cc) Sb ... 4.9968  
 Ver. ang ... 0.00 lQ/lm ... 0.0283  
 Hor. ang ... 0.00 lQ/lM ... 0.0173  
 Fd ... 54.31 lm/lb ... 2.6605  
 Uj/Ua ... 35.37 lM/lb ... 4.3395

Coflowing case:

dMj ... 0.1375  
 lm\* ... 1.8539  
 Sm\* ... 34.3678

Stratification case:

T ... -4784.49

| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 7.074             |
| 0.180                          | 0.000    | 0.000    | 0.058                  | 1.95                | 7.5026                       | 3.672             |
| 0.545                          | 0.000    | 0.001    | 0.112                  | 3.86                | 3.7764                       | 1.942             |
| 1.275                          | 0.000    | 0.006    | 0.213                  | 7.67                | 1.8983                       | 1.074             |
| 2.742                          | 0.000    | 0.041    | 0.390                  | 15.26               | 0.9518                       | 0.639             |
| 5.640                          | 0.000    | 0.227    | 0.678                  | 30.44               | 0.4701                       | 0.421             |
| 9.444                          | 0.000    | 0.672    | 1.113                  | 60.83               | 0.2190                       | 0.313             |
| 14.335                         | 0.000    | 1.387    | 1.733                  | 121.56              | 0.0837                       | 0.258             |
| 22.014                         | 0.000    | 2.419    | 2.598                  | 242.74              | 0.0045                       | 0.229             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| 44.235                         | 0.000    | 3.315    | 3.519                  | 420.30              | -0.0295                      | 0.216             |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 96.046                         | 0.000    | 3.078    | 4.753                  | 741.70              | -0.0180                      | 0.209             |
| 198.031                        | 0.000    | 2.545    | 6.025                  | 1173.18             | 0.0084                       | 0.206             |
| 393.307                        | 0.000    | 2.853    | 7.712                  | 1901.45             | -0.0067                      | 0.204             |
| 778.127                        | 0.000    | 2.653    | 9.755                  | 3022.90             | 0.0033                       | 0.202             |
| 1572.414                       | 0.000    | 2.768    | 12.464                 | 4914.13             | -0.0025                      | 0.201             |
| 2647.299                       | 0.000    | 2.744    | 16.281                 | 8361.26             | -0.0012                      | 0.201             |
| 2657.920                       | 0.000    | 2.804    | 16.322                 | 8402.68             | -0.0042                      | 0.201             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.5078 M ABOVE DISCHARGE PORT

AVG DILUTION = 254.8097 B = 2.67 M

MAXIMUM RISE (CENTER) = 3.4240 M ABOVE DISCHARGE PORT

AVG DILUTION = 402.7245 B = 3.44 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 10 JETLAG 2000

TITLE Jet10

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.66E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.7069 (m)       |
| dp/pa    | ... | 0.02883       | lm    | ... | 3.0675 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 4.9968           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 180.00        | lQ/lm | ... | 0.0173           |
| Fd       | ... | 54.31         | lm/lb | ... | 2.6605           |
| Uj/Ua    | ... | 35.37         | lm/lb | ... | 4.3395           |

Coflowing case:

dMj ... 0.1375  
lm\* ... 1.8539  
Sm\* ... 34.3678

Stratification case:

T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 7.074             |
| -0.175                         | 0.000 | 0.000 | 0.060           | 1.95                | 7.5040                       | 3.475             |
| -0.529                         | 0.000 | 0.001 | 0.122           | 3.86                | 3.7785                       | 1.644             |
| -1.236                         | 0.000 | 0.009 | 0.259           | 7.65                | 1.9031                       | 0.727             |
| -2.564                         | 0.000 | 0.097 | 0.559           | 14.42               | 1.0055                       | 0.293             |
| -4.346                         | 0.000 | 0.694 | 1.038           | 22.90               | 0.6089                       | 0.135             |
| -4.676                         | 0.000 | 1.137 | 1.683           | 33.86               | 0.3941                       | 0.076             |
| -4.367                         | 0.000 | 1.499 | 1.979           | 62.61               | 0.1994                       | 0.102             |
| -2.271                         | 0.000 | 2.292 | 2.300           | 123.38              | 0.0720                       | 0.149             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| 3.406                          | 0.000 | 3.466 | 3.008           | 246.20              | -0.0066                      | 0.173             |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |                   |
| 24.088                         | 0.000 | 3.949 | 3.804           | 417.17              | -0.0174                      | 0.184             |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |                   |
| 65.868                         | 0.000 | 3.924 | 4.940           | 729.75              | -0.0185                      | 0.190             |
| 155.175                        | 0.000 | 3.310 | 6.167           | 1158.53             | 0.0122                       | 0.194             |
| 334.327                        | 0.000 | 3.506 | 7.765           | 1858.27             | 0.0024                       | 0.196             |
| 694.819                        | 0.000 | 3.649 | 9.793           | 2977.26             | -0.0045                      | 0.198             |
| 1453.027                       | 0.000 | 3.504 | 12.472          | 4851.61             | 0.0026                       | 0.199             |
| 1464.459                       | 0.000 | 3.491 | 12.503          | 4875.27             | 0.0032                       | 0.199             |



NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 3.3273 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 229.4070 B = 2.92 M  
 MAXIMUM RISE (CENTER) = 4.3286 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 364.2120 B = 3.58 M  
 COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

### SIMULACIÓN 7

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 1 JETLAG 2000  
 TITLE Jet1

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^  

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0100 (m3/s) | Qj    | ... 1.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 3.54E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 2.83E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 3.5368 (m/s)  | lm    | ... 1.8806 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb    | ... 2.8275 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 1.5337 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 35.3678          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 79.9493          |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0283           |
| Hor. ang | ... 90.00         | lQ/lM | ... 0.0347           |
| Fd       | ... 27.15         | lm/lb | ... 0.6651           |
| Uj/Ua    | ... 35.37         | lM/lb | ... 0.5424           |

Stratification case:  
 T ... -4784.49

| X | Y | Z | PLUME | AVERAGE | DENSITY | VELOCITY |
|---|---|---|-------|---------|---------|----------|
|---|---|---|-------|---------|---------|----------|

NUMBER OF STEPS = 1500  
NEUTRAL BUOYANCY LEVEL = 2.4248 M ABOVE DISCHARGE PORT  
AVG DILUTION = 251.8524 B = 2.78 M  
MAXIMUM RISE (CENTER) = 3.3381 M ABOVE DISCHARGE PORT  
AVG DILUTION = 423.5699 B = 3.67 M

1 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^

[illegible]

## LENGTH & DILUTION SCALES

Stratification case:

T ... -4784.49

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 3.537             |
| -0.175   | 0.000    | 0.000    | 0.060                  | 1.95                | 7.5040                       | 1.738             |
| -0.529   | 0.000    | 0.004    | 0.122                  | 3.86                | 3.7784                       | 0.822             |
| -1.234   | 0.000    | 0.037    | 0.259                  | 7.65                | 1.9006                       | 0.365             |
| -2.584   | 0.000    | 0.387    | 0.520                  | 14.22               | 1.0084                       | 0.168             |
| -3.347   | 0.000    | 1.169    | 1.032                  | 28.46               | 0.4767                       | 0.085             |
| -3.280   | 0.000    | 1.645    | 1.637                  | 56.87               | 0.2221                       | 0.068             |
| -2.571   | 0.000    | 2.208    | 2.108                  | 110.90              | 0.0926                       | 0.079             |
| -0.180   | 0.000    | 3.276    | 2.817                  | 221.37              | 0.0076                       | 0.089             |

NEUTRAL BUOYANCY LEVEL REACHED

MAXIMUM RISE REACHED

7.312 0.000 4.365 3.690 388.95 -0.0372 0.091

TRAPPING LEVEL REACHED

26.632 0.000 3.579 4.699 659.84 0.0014 0.095

65.692 0.000 3.807 5.916 1064.51 -0.0083 0.097

144.850 0.000 3.796 7.497 1729.89 -0.0080 0.098

304.709 0.000 3.526 9.401 2740.55 0.0054 0.099

640.783 0.000 3.607 11.937 4441.07 0.0014 0.099

1168.625 0.000 3.611 15.627 7637.62 0.0011 0.100

1173.879 0.000 3.551 15.670 7678.35 0.0040 0.100

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.4239 M ABOVE DISCHARGE PORT

AVG DILUTION = 240.2180 B = 2.93 M

MAXIMUM RISE (CENTER) = 4.3732 M ABOVE DISCHARGE PORT

AVG DILUTION = 388.1041 B = 3.69 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 3 JETLAG 2000

TITLE Jet3

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC

SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)

COFLOW FACTOR : STANDARD

TIME STEP CONTRL : VARIABLE ( > 0.985 )

MAX NUMBER OF TIME STEPS : 1500

PRINTOUT INTERVAL : 100

MAX NUMBER OF ITERATIONS : 5

ITERATION ERROR BOUND : 0.00100

APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

DEPTH(m) S T(C) SIGMAT U(m/s)

EXIT 29.30 0.00 20.00 -1.73 3.537

AMBIENT 0.00 37.00 25.00 24.88 0.100

30.00 38.50 18.00 27.97 0.100

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

Total Q ... 0.0100 (m3/s) Qj ... 1.00E-02 (m3/s)

Port No. ... 1 Mj ... 3.54E-02 (m4/s2)

Depth ... 29.3000 (m) Bj ... 2.83E-03 (m4/s3)

Diameter ... 0.0600 (m) lQ ... 0.0532 (m)

Uj ... 3.5368 (m/s) lm ... 1.8806 (m)

Ua ... 0.1000 (m/s) lb ... 2.8275 (m)

dp/pa ... 0.02883 lm ... 1.5337 (m)

po ... 0.99827(g/cc) Sm ... 35.3678

pa ... 1.02790(g/cc) Sb ... 79.9493

Ver. ang ... 0.00 lQ/lm ... 0.0283

Hor. ang ... 0.00  
Fd ... 27.15  
Uj/Ua ... 35.37

lq/lm ... 0.0347  
lm/lb ... 0.6651  
lM/lb ... 0.5424

Coflowing case:

dMj ... 0.0344  
lm\* ... 1.8539  
sm\* ... 34.3678

Stratification case:

T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 3.537    |
| 0.180                          | 0.000 | 0.000 | 0.058           | 1.95                | 7.5026                       | 1.836    |
| 0.545                          | 0.000 | 0.003 | 0.112           | 3.86                | 3.7763                       | 0.971    |
| 1.273                          | 0.000 | 0.025 | 0.213           | 7.67                | 1.8976                       | 0.537    |
| 2.708                          | 0.000 | 0.160 | 0.388           | 15.27               | 0.9473                       | 0.322    |
| 4.665                          | 0.000 | 0.575 | 0.668           | 30.50               | 0.4588                       | 0.217    |
| 6.757                          | 0.000 | 1.239 | 1.089           | 60.99               | 0.2056                       | 0.164    |
| 9.301                          | 0.000 | 2.115 | 1.700           | 121.90              | 0.0713                       | 0.134    |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |          |
| 13.341                         | 0.000 | 3.261 | 2.576           | 243.33              | -0.0059                      | 0.117    |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |          |
| 26.449                         | 0.000 | 3.716 | 3.458           | 409.73              | -0.0155                      | 0.109    |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |          |
| 50.614                         | 0.000 | 3.759 | 4.649           | 710.91              | -0.0201                      | 0.105    |
| 98.742                         | 0.000 | 3.117 | 5.908           | 1129.47             | 0.0117                       | 0.103    |
| 191.280                        | 0.000 | 3.289 | 7.527           | 1813.43             | 0.0032                       | 0.102    |
| 373.736                        | 0.000 | 3.396 | 9.563           | 2906.35             | -0.0020                      | 0.101    |
| 752.855                        | 0.000 | 3.419 | 12.259          | 4754.45             | -0.0031                      | 0.101    |
| 1292.018                       | 0.000 | 3.382 | 16.102          | 8180.36             | -0.0013                      | 0.100    |
| 1297.324                       | 0.000 | 3.442 | 16.145          | 8222.40             | -0.0042                      | 0.100    |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.1379 M ABOVE DISCHARGE PORT

AVG DILUTION = 228.5233 B = 2.48 M

MAXIMUM RISE (CENTER) = 4.1516 M ABOVE DISCHARGE PORT

AVG DILUTION = 358.3134 B = 3.23 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 4 JETLAG 2000  
TITLE Jet4

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.83E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 2.8275 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 1.5337 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 79.9493          |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0347           |
| Fd       | ... | 27.15         | lm/lb | ... | 0.6651           |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 0.5424           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0344  |
| lm* | ... | 1.8539  |
| sm* | ... | 34.3678 |

Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 3.537             |
| -0.175                         | 0.000 | 0.000 | 0.060           | 1.95                | 7.5040                       | 1.738             |
| -0.529                         | 0.000 | 0.004 | 0.122           | 3.86                | 3.7784                       | 0.822             |
| -1.234                         | 0.000 | 0.037 | 0.259           | 7.65                | 1.9006                       | 0.365             |
| -2.584                         | 0.000 | 0.387 | 0.520           | 14.22               | 1.0084                       | 0.168             |
| -3.347                         | 0.000 | 1.169 | 1.032           | 28.46               | 0.4767                       | 0.085             |
| -3.280                         | 0.000 | 1.645 | 1.637           | 56.87               | 0.2221                       | 0.068             |
| -2.571                         | 0.000 | 2.208 | 2.108           | 110.90              | 0.0926                       | 0.079             |
| -0.180                         | 0.000 | 3.276 | 2.817           | 221.37              | 0.0076                       | 0.089             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |                   |
| 7.312                          | 0.000 | 4.365 | 3.690           | 388.95              | -0.0372                      | 0.091             |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |                   |
| 26.632                         | 0.000 | 3.579 | 4.699           | 659.84              | 0.0014                       | 0.095             |
| 65.692                         | 0.000 | 3.807 | 5.916           | 1064.51             | -0.0083                      | 0.097             |
| 144.850                        | 0.000 | 3.796 | 7.497           | 1729.89             | -0.0080                      | 0.098             |
| 304.709                        | 0.000 | 3.526 | 9.401           | 2740.55             | 0.0054                       | 0.099             |
| 640.783                        | 0.000 | 3.607 | 11.937          | 4441.07             | 0.0014                       | 0.099             |
| 1168.625                       | 0.000 | 3.611 | 15.627          | 7637.62             | 0.0011                       | 0.100             |
| 1173.879                       | 0.000 | 3.551 | 15.670          | 7678.35             | 0.0040                       | 0.100             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.4239 M ABOVE DISCHARGE PORT

AVG DILUTION = 240.2180 B = 2.93 M

MAXIMUM RISE (CENTER) = 4.3732 M ABOVE DISCHARGE PORT

AVG DILUTION = 388.1041 B = 3.69 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

|          |      |             |
|----------|------|-------------|
| CASE NO. | 5    | JETLAG 2000 |
| TITLE    | Jet5 |             |

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                          |                        |
|--------------------------|------------------------|
| ENTRAINMENT HYPOTHESIS   | : ASYMMETRIC           |
| SHEAR ENTRAINMENT        | : VARIABLE (0 - 0.085) |
| COFLOW FACTOR            | : STANDARD             |
| TIME STEP CONTRL         | : VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS | : 1500                 |

|                            |           |
|----------------------------|-----------|
| PRINTOUT INTERVAL          | : 100     |
| MAX NUMBER OF ITERATIONS   | : 5       |
| ITERATION ERROR BOUND      | : 0.00100 |
| APPROX RATIO OF MASS/DMASS | : 144.0   |

# ENVIROMENTAL CONDITIONS

^^

|         |          |       |       |        |        |
|---------|----------|-------|-------|--------|--------|
|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| .....   | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
| AMBIENT | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

# LENGTH & DILUTION SCALES

^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.83E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 2.8275 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 1.5337 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 79.9493          |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0347           |
| Fd       | ... | 27.15         | lm/lb | ... | 0.6651           |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 0.5424           |

## Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0344  |
| lm* | ... | 1.8539  |
| Sm* | ... | 34.3678 |

## Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 3.537             |
| 0.180                          | 0.000 | 0.000 | 0.058           | 1.95                | 7.5026                       | 1.836             |
| 0.545                          | 0.000 | 0.003 | 0.112           | 3.86                | 3.7763                       | 0.971             |
| 1.273                          | 0.000 | 0.025 | 0.213           | 7.67                | 1.8976                       | 0.537             |
| 2.708                          | 0.000 | 0.160 | 0.388           | 15.27               | 0.9473                       | 0.322             |
| 4.665                          | 0.000 | 0.575 | 0.668           | 30.50               | 0.4588                       | 0.217             |
| 6.757                          | 0.000 | 1.239 | 1.089           | 60.99               | 0.2056                       | 0.164             |
| 9.301                          | 0.000 | 2.115 | 1.700           | 121.90              | 0.0713                       | 0.134             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| 13.341                         | 0.000 | 3.261 | 2.576           | 243.33              | -0.0059                      | 0.117             |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |                   |
| 26.449                         | 0.000 | 3.716 | 3.458           | 409.73              | -0.0155                      | 0.109             |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |                   |
| 50.614                         | 0.000 | 3.759 | 4.649           | 710.91              | -0.0201                      | 0.105             |
| 98.742                         | 0.000 | 3.117 | 5.908           | 1129.47             | 0.0117                       | 0.103             |
| 191.280                        | 0.000 | 3.289 | 7.527           | 1813.43             | 0.0032                       | 0.102             |
| 373.736                        | 0.000 | 3.396 | 9.563           | 2906.35             | -0.0020                      | 0.101             |
| 752.855                        | 0.000 | 3.419 | 12.259          | 4754.45             | -0.0031                      | 0.101             |
| 1292.018                       | 0.000 | 3.382 | 16.102          | 8180.36             | -0.0013                      | 0.100             |
| 1297.324                       | 0.000 | 3.442 | 16.145          | 8222.40             | -0.0042                      | 0.100             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.1379 M ABOVE DISCHARGE PORT

AVG DILUTION = 228.5233 B = 2.48 M

MAXIMUM RISE (CENTER) = 4.1516 M ABOVE DISCHARGE PORT

AVG DILUTION = 358.3134 B = 3.23 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

|          |      |             |
|----------|------|-------------|
| CASE NO. | 6    | JETLAG 2000 |
| TITLE    | Jet6 |             |

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 AAAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES  
 AAAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.83E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 2.8275 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 1.5337 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 79.9493          |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0347           |
| Fd       | ... | 27.15         | lm/lb | ... | 0.6651           |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 0.5424           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0344  |
| lm* | ... | 1.8539  |
| Sm* | ... | 34.3678 |

Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 3.537    |
| -0.175                         | 0.000 | 0.000 | 0.060           | 1.95                | 7.5040                       | 1.738    |
| -0.529                         | 0.000 | 0.004 | 0.122           | 3.86                | 3.7784                       | 0.822    |
| -1.234                         | 0.000 | 0.037 | 0.259           | 7.65                | 1.9006                       | 0.365    |
| -2.584                         | 0.000 | 0.387 | 0.520           | 14.22               | 1.0084                       | 0.168    |
| -3.347                         | 0.000 | 1.169 | 1.032           | 28.46               | 0.4767                       | 0.085    |
| -3.280                         | 0.000 | 1.645 | 1.637           | 56.87               | 0.2221                       | 0.068    |
| -2.571                         | 0.000 | 2.208 | 2.108           | 110.90              | 0.0926                       | 0.079    |
| -0.180                         | 0.000 | 3.276 | 2.817           | 221.37              | 0.0076                       | 0.089    |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |          |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |          |
| 7.312                          | 0.000 | 4.365 | 3.690           | 388.95              | -0.0372                      | 0.091    |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |          |
| 26.632                         | 0.000 | 3.579 | 4.699           | 659.84              | 0.0014                       | 0.095    |
| 65.692                         | 0.000 | 3.807 | 5.916           | 1064.51             | -0.0083                      | 0.097    |
| 144.850                        | 0.000 | 3.796 | 7.497           | 1729.89             | -0.0080                      | 0.098    |
| 304.709                        | 0.000 | 3.526 | 9.401           | 2740.55             | 0.0054                       | 0.099    |
| 640.783                        | 0.000 | 3.607 | 11.937          | 4441.07             | 0.0014                       | 0.099    |
| 1168.625                       | 0.000 | 3.611 | 15.627          | 7637.62             | 0.0011                       | 0.100    |
| 1173.879                       | 0.000 | 3.551 | 15.670          | 7678.35             | 0.0040                       | 0.100    |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.4239 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 240.2180 B = 2.93 M

MAXIMUM RISE (CENTER) = 4.3732 M ABOVE DISCHARGE PORT  
AVG DILUTION = 388.1041 B = 3.69 M

1 COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 7 JETLAG 2000  
TITLE Jet7

#### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

#### ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

#### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0100 (m3/s) | Qj    | ... 1.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 3.54E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 2.83E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 3.5368 (m/s)  | lm    | ... 1.8806 (m)       |
| ua       | ... 0.1000 (m/s)  | lb    | ... 2.8275 (m)       |
| dp/pa    | ... 0.02883       | lm    | ... 1.5337 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 35.3678          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 79.9493          |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0283           |
| Hor. ang | ... 0.00          | lQ/lm | ... 0.0347           |
| Fd       | ... 27.15         | lm/lb | ... 0.6651           |
| Uj/Ua    | ... 35.37         | lm/lb | ... 0.5424           |

Coflowing case:

dMj ... 0.0344  
lm\* ... 1.8539  
Sm\* ... 34.3678

Stratification case:

T ... -4784.49

| X                              | Y     | Z     | PLUME RADIUS | AVERAGE DILUTION | DENSITY DIFF. (sigmat) | VELOCITY |
|--------------------------------|-------|-------|--------------|------------------|------------------------|----------|
| (m)                            | (m)   | (m)   | (m)          |                  |                        | (m/s)    |
| 0.000                          | 0.000 | 0.000 | 0.030        | 1.00             | 29.6379                | 3.537    |
| 0.180                          | 0.000 | 0.000 | 0.058        | 1.95             | 7.5026                 | 1.836    |
| 0.545                          | 0.000 | 0.003 | 0.112        | 3.86             | 3.7763                 | 0.971    |
| 1.273                          | 0.000 | 0.025 | 0.213        | 7.67             | 1.8976                 | 0.537    |
| 2.708                          | 0.000 | 0.160 | 0.388        | 15.27            | 0.9473                 | 0.322    |
| 4.665                          | 0.000 | 0.575 | 0.668        | 30.50            | 0.4588                 | 0.217    |
| 6.757                          | 0.000 | 1.239 | 1.089        | 60.99            | 0.2056                 | 0.164    |
| 9.301                          | 0.000 | 2.115 | 1.700        | 121.90           | 0.0713                 | 0.134    |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |              |                  |                        |          |
| 13.341                         | 0.000 | 3.261 | 2.576        | 243.33           | -0.0059                | 0.117    |
| MAXIMUM RISE REACHED           |       |       |              |                  |                        |          |
| 26.449                         | 0.000 | 3.716 | 3.458        | 409.73           | -0.0155                | 0.109    |
| TRAPPING LEVEL REACHED         |       |       |              |                  |                        |          |
| 50.614                         | 0.000 | 3.759 | 4.649        | 710.91           | -0.0201                | 0.105    |



|          |       |       |        |         |         |       |
|----------|-------|-------|--------|---------|---------|-------|
| 98.742   | 0.000 | 3.117 | 5.908  | 1129.47 | 0.0117  | 0.103 |
| 191.280  | 0.000 | 3.289 | 7.527  | 1813.43 | 0.0032  | 0.102 |
| 373.736  | 0.000 | 3.396 | 9.563  | 2906.35 | -0.0020 | 0.101 |
| 752.855  | 0.000 | 3.419 | 12.259 | 4754.45 | -0.0031 | 0.101 |
| 1292.018 | 0.000 | 3.382 | 16.102 | 8180.36 | -0.0013 | 0.100 |
| 1297.324 | 0.000 | 3.442 | 16.145 | 8222.40 | -0.0042 | 0.100 |

NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 3.1379 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 228.5233 B = 2.48 M  
 MAXIMUM RISE (CENTER) = 4.1516 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 358.3134 B = 3.23 M

1 COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 8 JETLAG 2000  
 TITLE Jet8

# INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

# ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA  

|         |          |       |       |        |        |
|---------|----------|-------|-------|--------|--------|
|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

# LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA  

|              |               |           |                  |
|--------------|---------------|-----------|------------------|
| Total Q ...  | 0.0100 (m3/s) | Qj ...    | 1.00E-02 (m3/s)  |
| Port No. ... | 1             | Mj ...    | 3.54E-02 (m4/s2) |
| Depth ...    | 29.3000 (m)   | Bj ...    | 2.83E-03 (m4/s3) |
| Diameter ... | 0.0600 (m)    | lQ ...    | 0.0532 (m)       |
| Uj ...       | 3.5368 (m/s)  | lm ...    | 1.8806 (m)       |
| Ua ...       | 0.1000 (m/s)  | lb ...    | 2.8275 (m)       |
| dp/pa ...    | 0.02883       | lM ...    | 1.5337 (m)       |
| po ...       | 0.99827(g/cc) | Sm ...    | 35.3678          |
| pa ...       | 1.02790(g/cc) | Sb ...    | 79.9493          |
| Ver. ang ... | 0.00          | lQ/lm ... | 0.0283           |
| Hor. ang ... | 180.00        | lQ/lM ... | 0.0347           |
| Fd ...       | 27.15         | lm/lb ... | 0.6651           |
| Uj/Ua ...    | 35.37         | lM/lb ... | 0.5424           |

Coflowing case:  
 dMj ... 0.0344  
 lm\* ... 1.8539  
 Sm\* ... 34.3678

Stratification case:  
 T ... -4784.49

| X      | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)    | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000  | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 3.537             |
| -0.175 | 0.000 | 0.000 | 0.060           | 1.95                | 7.5040                       | 1.738             |
| -0.529 | 0.000 | 0.004 | 0.122           | 3.86                | 3.7784                       | 0.822             |
| -1.234 | 0.000 | 0.037 | 0.259           | 7.65                | 1.9006                       | 0.365             |

|        |       |       |       |        |        |       |
|--------|-------|-------|-------|--------|--------|-------|
| -2.584 | 0.000 | 0.387 | 0.520 | 14.22  | 1.0084 | 0.168 |
| -3.347 | 0.000 | 1.169 | 1.032 | 28.46  | 0.4767 | 0.085 |
| -3.280 | 0.000 | 1.645 | 1.637 | 56.87  | 0.2221 | 0.068 |
| -2.571 | 0.000 | 2.208 | 2.108 | 110.90 | 0.0926 | 0.079 |
| -0.180 | 0.000 | 3.276 | 2.817 | 221.37 | 0.0076 | 0.089 |

NEUTRAL BUOYANCY LEVEL REACHED

MAXIMUM RISE REACHED

|       |       |       |       |        |         |       |
|-------|-------|-------|-------|--------|---------|-------|
| 7.312 | 0.000 | 4.365 | 3.690 | 388.95 | -0.0372 | 0.091 |
|-------|-------|-------|-------|--------|---------|-------|

TRAPPING LEVEL REACHED

|          |       |       |        |         |         |       |
|----------|-------|-------|--------|---------|---------|-------|
| 26.632   | 0.000 | 3.579 | 4.699  | 659.84  | 0.0014  | 0.095 |
| 65.692   | 0.000 | 3.807 | 5.916  | 1064.51 | -0.0083 | 0.097 |
| 144.850  | 0.000 | 3.796 | 7.497  | 1729.89 | -0.0080 | 0.098 |
| 304.709  | 0.000 | 3.526 | 9.401  | 2740.55 | 0.0054  | 0.099 |
| 640.783  | 0.000 | 3.607 | 11.937 | 4441.07 | 0.0014  | 0.099 |
| 1168.625 | 0.000 | 3.611 | 15.627 | 7637.62 | 0.0011  | 0.100 |
| 1173.879 | 0.000 | 3.551 | 15.670 | 7678.35 | 0.0040  | 0.100 |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.4239 M ABOVE DISCHARGE PORT

AVG DILUTION = 240.2180 B = 2.93 M

MAXIMUM RISE (CENTER) = 4.3732 M ABOVE DISCHARGE PORT

AVG DILUTION = 388.1041 B = 3.69 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

..... JETLAG 2000

CASE NO. 9

TITLE Jet9

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |   |                      |
|----------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS     | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : | STANDARD             |
| TIME STEP CONTRL           | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : | 1500                 |
| PRINTOUT INTERVAL          | : | 100                  |
| MAX NUMBER OF ITERATIONS   | : | 5                    |
| ITERATION ERROR BOUND      | : | 0.00100              |
| APPROX RATIO OF MASS/DMASS | : | 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         |          |       |       |        |        |
|---------|----------|-------|-------|--------|--------|
|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.83E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 2.8275 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 1.5337 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 79.9493          |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0347           |
| Fd       | ... | 27.15         | lm/lb | ... | 0.6651           |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 0.5424           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dmj | ... | 0.0344  |
| lm* | ... | 1.8539  |
| Sm* | ... | 34.3678 |

Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 3.537    |
| 0.180                          | 0.000 | 0.000 | 0.058           | 1.95                | 7.5026                       | 1.836    |
| 0.545                          | 0.000 | 0.003 | 0.112           | 3.86                | 3.7763                       | 0.971    |
| 1.273                          | 0.000 | 0.025 | 0.213           | 7.67                | 1.8976                       | 0.537    |
| 2.708                          | 0.000 | 0.160 | 0.388           | 15.27               | 0.9473                       | 0.322    |
| 4.665                          | 0.000 | 0.575 | 0.668           | 30.50               | 0.4588                       | 0.217    |
| 6.757                          | 0.000 | 1.239 | 1.089           | 60.99               | 0.2056                       | 0.164    |
| 9.301                          | 0.000 | 2.115 | 1.700           | 121.90              | 0.0713                       | 0.134    |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |          |
| 13.341                         | 0.000 | 3.261 | 2.576           | 243.33              | -0.0059                      | 0.117    |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |          |
| 26.449                         | 0.000 | 3.716 | 3.458           | 409.73              | -0.0155                      | 0.109    |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |          |
| 50.614                         | 0.000 | 3.759 | 4.649           | 710.91              | -0.0201                      | 0.105    |
| 98.742                         | 0.000 | 3.117 | 5.908           | 1129.47             | 0.0117                       | 0.103    |
| 191.280                        | 0.000 | 3.289 | 7.527           | 1813.43             | 0.0032                       | 0.102    |
| 373.736                        | 0.000 | 3.396 | 9.563           | 2906.35             | -0.0020                      | 0.101    |
| 752.855                        | 0.000 | 3.419 | 12.259          | 4754.45             | -0.0031                      | 0.101    |
| 1292.018                       | 0.000 | 3.382 | 16.102          | 8180.36             | -0.0013                      | 0.100    |
| 1297.324                       | 0.000 | 3.442 | 16.145          | 8222.40             | -0.0042                      | 0.100    |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.1379 M ABOVE DISCHARGE PORT

AVG DILUTION = 228.5233 B = 2.48 M

MAXIMUM RISE (CENTER) = 4.1516 M ABOVE DISCHARGE PORT

AVG DILUTION = 358.3134 B = 3.23 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 10 JETLAG 2000  
TITLE Jet10

#### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

#### ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

#### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0100 (m3/s) | Qj    | ... 1.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 3.54E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 2.83E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 3.5368 (m/s)  | lm    | ... 1.8806 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb    | ... 2.8275 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 1.5337 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 35.3678          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 79.9493          |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0283           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0347           |
| Fd       | ... 27.15         | lm/lb | ... 0.6651           |

Uj/Ua ... 35.37

lm/lb ... 0.5424

Coflowing case:

dmj ... 0.0344

lm\* ... 1.8539

sm\* ... 34.3678

Stratification case:

T ... -4784.49

| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 3.537             |
| -0.175                         | 0.000    | 0.000    | 0.060                  | 1.95                | 7.5040                       | 1.738             |
| -0.529                         | 0.000    | 0.004    | 0.122                  | 3.86                | 3.7784                       | 0.822             |
| -1.234                         | 0.000    | 0.037    | 0.259                  | 7.65                | 1.9006                       | 0.365             |
| -2.584                         | 0.000    | 0.387    | 0.520                  | 14.22               | 1.0084                       | 0.168             |
| -3.347                         | 0.000    | 1.169    | 1.032                  | 28.46               | 0.4767                       | 0.085             |
| -3.280                         | 0.000    | 1.645    | 1.637                  | 56.87               | 0.2221                       | 0.068             |
| -2.571                         | 0.000    | 2.208    | 2.108                  | 110.90              | 0.0926                       | 0.079             |
| -0.180                         | 0.000    | 3.276    | 2.817                  | 221.37              | 0.0076                       | 0.089             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| 7.312                          | 0.000    | 4.365    | 3.690                  | 388.95              | -0.0372                      | 0.091             |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 26.632                         | 0.000    | 3.579    | 4.699                  | 659.84              | 0.0014                       | 0.095             |
| 65.692                         | 0.000    | 3.807    | 5.916                  | 1064.51             | -0.0083                      | 0.097             |
| 144.850                        | 0.000    | 3.796    | 7.497                  | 1729.89             | -0.0080                      | 0.098             |
| 304.709                        | 0.000    | 3.526    | 9.401                  | 2740.55             | 0.0054                       | 0.099             |
| 640.783                        | 0.000    | 3.607    | 11.937                 | 4441.07             | 0.0014                       | 0.099             |
| 1168.625                       | 0.000    | 3.611    | 15.627                 | 7637.62             | 0.0011                       | 0.100             |
| 1173.879                       | 0.000    | 3.551    | 15.670                 | 7678.35             | 0.0040                       | 0.100             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.4239 M ABOVE DISCHARGE PORT

AVG DILUTION = 240.2180 B = 2.93 M

MAXIMUM RISE (CENTER) = 4.3732 M ABOVE DISCHARGE PORT

AVG DILUTION = 388.1041 B = 3.69 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

## SIMULACIÓN 8

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 1 JETLAG 2000

TITLE Jet1

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

# LENGTH & DILUTION SCALES

^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|          |     |                |       |     |                  |
|----------|-----|----------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s)  | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1              | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)    | Bj    | ... | 4.24E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)     | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)   | lm    | ... | 2.8209 (m)       |
| Ua       | ... | 0.1000 (m/s)   | lb    | ... | 4.2413 (m)       |
| dp/pa    | ... | 0.02883        | lM    | ... | 2.3006 (m)       |
| po       | ... | 0.99827 (g/cc) | Sm    | ... | 53.0516          |
| pa       | ... | 1.02790 (g/cc) | Sb    | ... | 119.9239         |
| Ver. ang | ... | 0.00           | lQ/lm | ... | 0.0188           |
| Hor. ang | ... | 90.00          | lQ/lM | ... | 0.0231           |
| Fd       | ... | 40.73          | lm/lb | ... | 0.6651           |
| Uj/Ua    | ... | 53.05          | lM/lb | ... | 0.5424           |

Stratification case:

T ... -4784.49

| X                              | Y      | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------------------------------|--------|-------|-----------------|---------------------|------------------------------|----------|
| (m)                            | (m)    | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000                          | 0.000  | 0.000 | 0.030           | 1.00                | 29.6379                      | 5.305    |
| 0.002                          | 0.178  | 0.000 | 0.059           | 1.95                | 7.5033                       | 2.681    |
| 0.015                          | 0.547  | 0.002 | 0.116           | 3.84                | 3.7959                       | 1.354    |
| 0.077                          | 1.224  | 0.012 | 0.231           | 7.63                | 1.9070                       | 0.683    |
| 0.264                          | 2.177  | 0.061 | 0.453           | 15.21               | 0.9546                       | 0.353    |
| 0.692                          | 3.231  | 0.204 | 0.855           | 30.36               | 0.4728                       | 0.199    |
| 1.563                          | 4.282  | 0.525 | 1.463           | 60.62               | 0.2250                       | 0.135    |
| 3.301                          | 5.315  | 1.165 | 2.254           | 121.00              | 0.0892                       | 0.114    |
| 6.923                          | 6.391  | 2.319 | 3.310           | 241.56              | 0.0027                       | 0.105    |
| NEUTRAL BUOYANCY LEVEL REACHED |        |       |                 |                     |                              |          |
| MAXIMUM RISE REACHED           |        |       |                 |                     |                              |          |
| 16.963                         | 7.841  | 3.200 | 4.671           | 460.06              | -0.0268                      | 0.101    |
| TRAPPING LEVEL REACHED         |        |       |                 |                     |                              |          |
| 42.858                         | 9.876  | 2.976 | 6.454           | 872.96              | -0.0167                      | 0.100    |
| 105.874                        | 12.563 | 2.749 | 8.686           | 1580.81             | -0.0051                      | 0.100    |
| 256.630                        | 16.110 | 2.605 | 11.688          | 2861.46             | 0.0018                       | 0.100    |
| 629.453                        | 20.939 | 2.581 | 15.822          | 5242.23             | 0.0029                       | 0.100    |
| 1185.879                       | 25.068 | 2.554 | 21.197          | 9410.52             | 0.0043                       | 0.100    |
| 1728.324                       | 27.355 | 2.486 | 27.928          | 16335.71            | 0.0076                       | 0.100    |
| 1733.697                       | 27.372 | 2.538 | 27.973          | 16393.06            | 0.0051                       | 0.100    |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.3737 M ABOVE DISCHARGE PORT

AVG DILUTION = 248.3345 B = 3.36 M

MAXIMUM RISE (CENTER) = 3.3050 M ABOVE DISCHARGE PORT

AVG DILUTION = 421.9290 B = 4.48 M

SURFACE LAYER (CENTER) LEVEL = 2.61 M ABOVE DISCHARGE PORT

AVG DILUTION = 14922.50

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 2 JETLAG 2000  
TITLE Jet2

## INPUT PARAMETERS

^^^^^^^^^^^^^^^^^^^^^^^^

|                            |   |                      |
|----------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS     | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : | STANDARD             |
| TIME STEP CONTRL           | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : | 1500                 |
| PRINTOUT INTERVAL          | : | 100                  |
| MAX NUMBER OF ITERATIONS   | : | 5                    |
| ITERATION ERROR BOUND      | : | 0.00100              |
| APPROX RATIO OF MASS/DMASS | : | 144.0                |

# ENVIROMENTAL CONDITIONS

```

AAAAAAAAAAAAAAAAAAAA
      DEPTH(m)      S      T(C)      SIGMAT      U(m/s)
EXIT      29.30      0.00      20.00      -1.73      5.305
.....
AMBIENT      0.00      37.00      25.00      24.88      0.100
              30.00      38.50      18.00      27.97      0.100
    
```

# LENGTH & DILUTION SCALES

```

AAAAAAAAAAAAAAAAAAAA
Total Q ... 0.0150 (m3/s)      Qj ... 1.50E-02 (m3/s)
Port No. ... 1      Mj ... 7.96E-02 (m4/s2)
Depth ... 29.3000 (m)      Bj ... 4.24E-03 (m4/s3)
Diameter ... 0.0600 (m)      lQ ... 0.0532 (m)
Uj ... 5.3052 (m/s)      lm ... 2.8209 (m)
Ua ... 0.1000 (m/s)      lb ... 4.2413 (m)
dp/pa ... 0.02883      lM ... 2.3006 (m)
po ... 0.99827(g/cc)      Sm ... 53.0516
pa ... 1.02790(g/cc)      Sb ... 119.9239
Ver. ang ... 0.00      lQ/lm ... 0.0188
Hor. ang ... 180.00      lQ/lM ... 0.0231
Fd ... 40.73      lm/lb ... 0.6651
Uj/Ua ... 53.05      lM/lb ... 0.5424
    
```

Stratification case:  
T ... -4784.49

| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 5.305             |
| -0.176                         | 0.000    | 0.000    | 0.059                  | 1.95                | 7.5037                       | 2.631             |
| -0.531                         | 0.000    | 0.002    | 0.120                  | 3.86                | 3.7781                       | 1.270             |
| -1.242                         | 0.000    | 0.015    | 0.249                  | 7.66                | 1.8999                       | 0.588             |
| -2.637                         | 0.000    | 0.151    | 0.531                  | 15.02               | 0.9630                       | 0.254             |
| -4.701                         | 0.000    | 1.125    | 1.053                  | 28.36               | 0.4733                       | 0.122             |
| -5.140                         | 0.000    | 2.107    | 1.972                  | 56.68               | 0.2031                       | 0.070             |
| -4.742                         | 0.000    | 2.729    | 2.786                  | 113.23              | 0.0793                       | 0.070             |
| -2.721                         | 0.000    | 3.772    | 3.609                  | 222.70              | 0.0014                       | 0.082             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| 5.452                          | 0.000    | 4.698    | 4.538                  | 372.34              | -0.0337                      | 0.086             |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 25.727                         | 0.000    | 4.303    | 5.813                  | 652.87              | -0.0151                      | 0.092             |
| 68.962                         | 0.000    | 3.736    | 7.233                  | 1040.53             | 0.0137                       | 0.095             |
| 157.495                        | 0.000    | 3.898    | 8.985                  | 1637.23             | 0.0056                       | 0.097             |
| 338.707                        | 0.000    | 4.124    | 11.315                 | 2627.94             | -0.0056                      | 0.098             |
| 726.282                        | 0.000    | 4.011    | 14.469                 | 4332.40             | 0.0001                       | 0.099             |
| 1256.312                       | 0.000    | 3.910    | 18.993                 | 7502.29             | 0.0050                       | 0.099             |
| 1261.629                       | 0.000    | 3.942    | 19.026                 | 7529.86             | 0.0035                       | 0.099             |

NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 3.8004 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 225.9042 B = 3.63 M  
 MAXIMUM RISE (CENTER) = 4.8105 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 363.5522 B = 4.50 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 CASE NO. 3 JETLAG 2000  
 TITLE Jet3

# INPUT PARAMETERS

```

AAAAAAAAAAAAAAAAAAAA
ENTRAINMENT HYPOTHESIS      : ASYMMETRIC
SHEAR ENTRAINMENT           : VARIABLE (0 - 0.085)
COFLOW FACTOR                : STANDARD
TIME STEP CONTRL             : VARIABLE ( > 0.985 )
    
```

MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES

^^

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj    | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 4.24E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | lm    | ... 2.8209 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb    | ... 4.2413 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 2.3006 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 53.0516          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 119.9239         |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0188           |
| Hor. ang | ... 0.00          | lQ/lM | ... 0.0231           |
| Fd       | ... 40.73         | lm/lb | ... 0.6651           |
| Uj/Ua    | ... 53.05         | lM/lb | ... 0.5424           |

Coflowing case:

dMj ... 0.0781  
 lm\* ... 2.7942  
 Sm\* ... 52.0516

Stratification case:

T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 5.305             |
| 0.180                          | 0.000 | 0.000 | 0.058           | 1.95                | 7.5028                       | 2.730             |
| 0.542                          | 0.000 | 0.001 | 0.114           | 3.86                | 3.7767                       | 1.419             |
| 1.266                          | 0.000 | 0.012 | 0.219           | 7.67                | 1.8984                       | 0.762             |
| 2.712                          | 0.000 | 0.082 | 0.410           | 15.26               | 0.9506                       | 0.433             |
| 5.326                          | 0.000 | 0.438 | 0.732           | 30.44               | 0.4630                       | 0.271             |
| 8.390                          | 0.000 | 1.224 | 1.232           | 60.86               | 0.2030                       | 0.191             |
| 11.850                         | 0.000 | 2.335 | 1.977           | 121.67              | 0.0615                       | 0.149             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| 17.261                         | 0.000 | 3.789 | 3.065           | 242.67              | -0.0221                      | 0.123             |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |                   |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |                   |
| 33.147                         | 0.000 | 3.454 | 4.126           | 404.84              | 0.0076                       | 0.114             |
| 62.979                         | 0.000 | 3.630 | 5.413           | 663.12              | -0.0034                      | 0.108             |
| 117.964                        | 0.000 | 3.815 | 7.001           | 1074.99             | -0.0135                      | 0.105             |
| 223.663                        | 0.000 | 3.371 | 8.919           | 1715.22             | 0.0084                       | 0.103             |
| 432.273                        | 0.000 | 3.437 | 11.350          | 2747.60             | 0.0052                       | 0.102             |
| 861.830                        | 0.000 | 3.616 | 14.711          | 4582.91             | -0.0037                      | 0.101             |
| 1402.316                       | 0.000 | 3.579 | 19.328          | 7876.32             | -0.0018                      | 0.101             |
| 1407.629                       | 0.000 | 3.647 | 19.380          | 7916.33             | -0.0052                      | 0.101             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.2955 M ABOVE DISCHARGE PORT

AVG DILUTION = 197.1617 B = 2.69 M

MAXIMUM RISE (CENTER) = 4.4650 M ABOVE DISCHARGE PORT

AVG DILUTION = 310.0082 B = 3.57 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

.....  
CASE NO. 4 JETLAG 2000  
TITLE Jet4

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj    | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 4.24E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | lm    | ... 2.8209 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb    | ... 4.2413 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 2.3006 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 53.0516          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 119.9239         |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0188           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0231           |
| Fd       | ... 40.73         | lm/lb | ... 0.6651           |
| Uj/Ua    | ... 53.05         | lM/lb | ... 0.5424           |

Coflowing case:

dMj ... 0.0781  
lm\* ... 2.7942  
Sm\* ... 52.0516

Stratification case:

T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 5.305             |
| -0.176                         | 0.000 | 0.000 | 0.059           | 1.95                | 7.5037                       | 2.631             |
| -0.531                         | 0.000 | 0.002 | 0.120           | 3.86                | 3.7781                       | 1.270             |
| -1.242                         | 0.000 | 0.015 | 0.249           | 7.66                | 1.8999                       | 0.588             |
| -2.637                         | 0.000 | 0.151 | 0.531           | 15.02               | 0.9630                       | 0.254             |
| -4.701                         | 0.000 | 1.125 | 1.053           | 28.36               | 0.4733                       | 0.122             |
| -5.140                         | 0.000 | 2.107 | 1.972           | 56.68               | 0.2031                       | 0.070             |
| -4.742                         | 0.000 | 2.729 | 2.786           | 113.23              | 0.0793                       | 0.070             |
| -2.721                         | 0.000 | 3.772 | 3.609           | 222.70              | 0.0014                       | 0.082             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |                   |
| 5.452                          | 0.000 | 4.698 | 4.538           | 372.34              | -0.0337                      | 0.086             |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |                   |
| 25.727                         | 0.000 | 4.303 | 5.813           | 652.87              | -0.0151                      | 0.092             |
| 68.962                         | 0.000 | 3.736 | 7.233           | 1040.53             | 0.0137                       | 0.095             |
| 157.495                        | 0.000 | 3.898 | 8.985           | 1637.23             | 0.0056                       | 0.097             |
| 338.707                        | 0.000 | 4.124 | 11.315          | 2627.94             | -0.0056                      | 0.098             |
| 726.282                        | 0.000 | 4.011 | 14.469          | 4332.40             | 0.0001                       | 0.099             |
| 1256.312                       | 0.000 | 3.910 | 18.993          | 7502.29             | 0.0050                       | 0.099             |
| 1261.629                       | 0.000 | 3.942 | 19.026          | 7529.86             | 0.0035                       | 0.099             |



NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 3.8004 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 225.9042 B = 3.63 M  
 MAXIMUM RISE (CENTER) = 4.8105 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 363.5522 B = 4.50 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 5 JETLAG 2000  
 TITLE Jet5

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^  

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj    | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 4.24E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | lm    | ... 2.8209 (m)       |
| ua       | ... 0.1000 (m/s)  | lb    | ... 4.2413 (m)       |
| dp/pa    | ... 0.02883       | lm    | ... 2.3006 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 53.0516          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 119.9239         |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0188           |
| Hor. ang | ... 0.00          | lQ/lm | ... 0.0231           |
| Fd       | ... 40.73         | lm/lb | ... 0.6651           |
| Uj/Ua    | ... 53.05         | lm/lb | ... 0.5424           |

Coflowing case:  
 dmj ... 0.0781  
 lm\* ... 2.7942  
 Sm\* ... 52.0516

Stratification case:  
 T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 5.305             |
| 0.180                          | 0.000 | 0.000 | 0.058           | 1.95                | 7.5028                       | 2.730             |
| 0.542                          | 0.000 | 0.001 | 0.114           | 3.86                | 3.7767                       | 1.419             |
| 1.266                          | 0.000 | 0.012 | 0.219           | 7.67                | 1.8984                       | 0.762             |
| 2.712                          | 0.000 | 0.082 | 0.410           | 15.26               | 0.9506                       | 0.433             |
| 5.326                          | 0.000 | 0.438 | 0.732           | 30.44               | 0.4630                       | 0.271             |
| 8.390                          | 0.000 | 1.224 | 1.232           | 60.86               | 0.2030                       | 0.191             |
| 11.850                         | 0.000 | 2.335 | 1.977           | 121.67              | 0.0615                       | 0.149             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| 17.261                         | 0.000 | 3.789 | 3.065           | 242.67              | -0.0221                      | 0.123             |

| MAXIMUM RISE REACHED   |       |       |        |         |         |       |  |
|------------------------|-------|-------|--------|---------|---------|-------|--|
| TRAPPING LEVEL REACHED |       |       |        |         |         |       |  |
| 33.147                 | 0.000 | 3.454 | 4.126  | 404.84  | 0.0076  | 0.114 |  |
| 62.979                 | 0.000 | 3.630 | 5.413  | 663.12  | -0.0034 | 0.108 |  |
| 117.964                | 0.000 | 3.815 | 7.001  | 1074.99 | -0.0135 | 0.105 |  |
| 223.663                | 0.000 | 3.371 | 8.919  | 1715.22 | 0.0084  | 0.103 |  |
| 432.273                | 0.000 | 3.437 | 11.350 | 2747.60 | 0.0052  | 0.102 |  |
| 861.830                | 0.000 | 3.616 | 14.711 | 4582.91 | -0.0037 | 0.101 |  |
| 1402.316               | 0.000 | 3.579 | 19.328 | 7876.32 | -0.0018 | 0.101 |  |
| 1407.629               | 0.000 | 3.647 | 19.380 | 7916.33 | -0.0052 | 0.101 |  |

NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 3.2955 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 197.1617 B = 2.69 M  
 MAXIMUM RISE (CENTER) = 4.4650 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 310.0082 B = 3.57 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 6 JETLAG 2000  
 TITLE Jet6

INPUT PARAMETERS  
 ^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^  

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 4.24E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 2.8209 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 4.2413 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 2.3006 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 53.0516          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 119.9239         |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0188           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0231           |
| Fd       | ... | 40.73         | lm/lb | ... | 0.6651           |
| Uj/Ua    | ... | 53.05         | lM/lb | ... | 0.5424           |

Coflowing case:  
 dMj ... 0.0781  
 lm\* ... 2.7942  
 Sm\* ... 52.0516

Stratification case:  
 T ... -4784.49

| X   | Y   | Z   | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|-----|-----|-----|-----------------|---------------------|------------------------------|-------------------|
| (m) | (m) | (m) | (m)             |                     |                              |                   |

```

.....
0.000 0.000 0.000 0.030 1.00 29.6379 5.305
-0.176 0.000 0.000 0.059 1.95 7.5037 2.631
-0.531 0.000 0.002 0.120 3.86 3.7781 1.270
-1.242 0.000 0.015 0.249 7.66 1.8999 0.588
-2.637 0.000 0.151 0.531 15.02 0.9630 0.254
-4.701 0.000 1.125 1.053 28.36 0.4733 0.122
-5.140 0.000 2.107 1.972 56.68 0.2031 0.070
-4.742 0.000 2.729 2.786 113.23 0.0793 0.070
-2.721 0.000 3.772 3.609 222.70 0.0014 0.082
NEUTRAL BUOYANCY LEVEL REACHED
MAXIMUM RISE REACHED
5.452 0.000 4.698 4.538 372.34 -0.0337 0.086
TRAPPING LEVEL REACHED
25.727 0.000 4.303 5.813 652.87 -0.0151 0.092
68.962 0.000 3.736 7.233 1040.53 0.0137 0.095
157.495 0.000 3.898 8.985 1637.23 0.0056 0.097
338.707 0.000 4.124 11.315 2627.94 -0.0056 0.098
726.282 0.000 4.011 14.469 4332.40 0.0001 0.099
1256.312 0.000 3.910 18.993 7502.29 0.0050 0.099
1261.629 0.000 3.942 19.026 7529.86 0.0035 0.099

```

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.8004 M ABOVE DISCHARGE PORT

AVG DILUTION = 225.9042 B = 3.63 M

MAXIMUM RISE (CENTER) = 4.8105 M ABOVE DISCHARGE PORT

AVG DILUTION = 363.5522 B = 4.50 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 7 JETLAG 2000  
TITLE Jet7

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 4.24E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 2.8209 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 4.2413 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 2.3006 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 53.0516          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 119.9239         |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0188           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0231           |
| Fd       | ... | 40.73         | lm/lb | ... | 0.6651           |
| Uj/Ua    | ... | 53.05         | lM/lb | ... | 0.5424           |

Coflowing case:

dMj ... 0.0781  
lm\* ... 2.7942

Sm\* ... 52.0516

Stratification case:  
T ... -4784.49

| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 5.305             |
| 0.180                          | 0.000    | 0.000    | 0.058                  | 1.95                | 7.5028                       | 2.730             |
| 0.542                          | 0.000    | 0.001    | 0.114                  | 3.86                | 3.7767                       | 1.419             |
| 1.266                          | 0.000    | 0.012    | 0.219                  | 7.67                | 1.8984                       | 0.762             |
| 2.712                          | 0.000    | 0.082    | 0.410                  | 15.26               | 0.9506                       | 0.433             |
| 5.326                          | 0.000    | 0.438    | 0.732                  | 30.44               | 0.4630                       | 0.271             |
| 8.390                          | 0.000    | 1.224    | 1.232                  | 60.86               | 0.2030                       | 0.191             |
| 11.850                         | 0.000    | 2.335    | 1.977                  | 121.67              | 0.0615                       | 0.149             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| 17.261                         | 0.000    | 3.789    | 3.065                  | 242.67              | -0.0221                      | 0.123             |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 33.147                         | 0.000    | 3.454    | 4.126                  | 404.84              | 0.0076                       | 0.114             |
| 62.979                         | 0.000    | 3.630    | 5.413                  | 663.12              | -0.0034                      | 0.108             |
| 117.964                        | 0.000    | 3.815    | 7.001                  | 1074.99             | -0.0135                      | 0.105             |
| 223.663                        | 0.000    | 3.371    | 8.919                  | 1715.22             | 0.0084                       | 0.103             |
| 432.273                        | 0.000    | 3.437    | 11.350                 | 2747.60             | 0.0052                       | 0.102             |
| 861.830                        | 0.000    | 3.616    | 14.711                 | 4582.91             | -0.0037                      | 0.101             |
| 1402.316                       | 0.000    | 3.579    | 19.328                 | 7876.32             | -0.0018                      | 0.101             |
| 1407.629                       | 0.000    | 3.647    | 19.380                 | 7916.33             | -0.0052                      | 0.101             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.2955 M ABOVE DISCHARGE PORT

AVG DILUTION = 197.1617 B = 2.69 M

MAXIMUM RISE (CENTER) = 4.4650 M ABOVE DISCHARGE PORT

AVG DILUTION = 310.0082 B = 3.57 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 8 JETLAG 2000  
TITLE Jet8

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |    |                      |
|----------|-------------------|----|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj | ... 4.24E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | lm | ... 2.8209 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb | ... 4.2413 (m)       |

```
dp/pa    ...    0.02883          lM ...    2.3006 (m)
po       ...    0.99827(g/cc)     Sm ...    53.0516
pa       ...    1.02790(g/cc)     Sb ...    119.9239
ver. ang ...    0.00             lQ/lm ...    0.0188
Hor. ang ... 180.00             lQ/lm ...    0.0231
Fd       ...    40.73            lm/lb ...    0.6651
Uj/Ua    ...    53.05            lM/lb ...    0.5424
```

Coflowing case:

```
dMj ...    0.0781
lm*  ...    2.7942
Sm*  ...    52.0516
```

Stratification case:

```
T ... -4784.49
```

| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 5.305             |
| -0.176                         | 0.000    | 0.000    | 0.059                  | 1.95                | 7.5037                       | 2.631             |
| -0.531                         | 0.000    | 0.002    | 0.120                  | 3.86                | 3.7781                       | 1.270             |
| -1.242                         | 0.000    | 0.015    | 0.249                  | 7.66                | 1.8999                       | 0.588             |
| -2.637                         | 0.000    | 0.151    | 0.531                  | 15.02               | 0.9630                       | 0.254             |
| -4.701                         | 0.000    | 1.125    | 1.053                  | 28.36               | 0.4733                       | 0.122             |
| -5.140                         | 0.000    | 2.107    | 1.972                  | 56.68               | 0.2031                       | 0.070             |
| -4.742                         | 0.000    | 2.729    | 2.786                  | 113.23              | 0.0793                       | 0.070             |
| -2.721                         | 0.000    | 3.772    | 3.609                  | 222.70              | 0.0014                       | 0.082             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| 5.452                          | 0.000    | 4.698    | 4.538                  | 372.34              | -0.0337                      | 0.086             |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 25.727                         | 0.000    | 4.303    | 5.813                  | 652.87              | -0.0151                      | 0.092             |
| 68.962                         | 0.000    | 3.736    | 7.233                  | 1040.53             | 0.0137                       | 0.095             |
| 157.495                        | 0.000    | 3.898    | 8.985                  | 1637.23             | 0.0056                       | 0.097             |
| 338.707                        | 0.000    | 4.124    | 11.315                 | 2627.94             | -0.0056                      | 0.098             |
| 726.282                        | 0.000    | 4.011    | 14.469                 | 4332.40             | 0.0001                       | 0.099             |
| 1256.312                       | 0.000    | 3.910    | 18.993                 | 7502.29             | 0.0050                       | 0.099             |
| 1261.629                       | 0.000    | 3.942    | 19.026                 | 7529.86             | 0.0035                       | 0.099             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.8004 M ABOVE DISCHARGE PORT

AVG DILUTION = 225.9042 B = 3.63 M

MAXIMUM RISE (CENTER) = 4.8105 M ABOVE DISCHARGE PORT

AVG DILUTION = 363.5522 B = 4.50 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 9 JETLAG 2000  
TITLE Jet9

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

```
ENTRAINMENT HYPOTHESIS : ASYMMETRIC
SHEAR ENTRAINMENT      : VARIABLE (0 - 0.085)
COFLOW FACTOR          : STANDARD
TIME STEP CONTRL       : VARIABLE ( > 0.985 )
MAX NUMBER OF TIME STEPS : 1500
PRINTOUT INTERVAL      : 100
MAX NUMBER OF ITERATIONS : 5
ITERATION ERROR BOUND   : 0.00100
APPROX RATIO OF MASS/DMASS : 144.0
```

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |

30.00 38.50 18.00 27.97 0.100

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 4.24E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 2.8209 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 4.2413 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 2.3006 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 53.0516          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 119.9239         |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0188           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0231           |
| Fd       | ... | 40.73         | lm/lb | ... | 0.6651           |
| Uj/Ua    | ... | 53.05         | lM/lb | ... | 0.5424           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0781  |
| lm* | ... | 2.7942  |
| Sm* | ... | 52.0516 |

Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 5.305             |
| 0.180                          | 0.000 | 0.000 | 0.058           | 1.95                | 7.5028                       | 2.730             |
| 0.542                          | 0.000 | 0.001 | 0.114           | 3.86                | 3.7767                       | 1.419             |
| 1.266                          | 0.000 | 0.012 | 0.219           | 7.67                | 1.8984                       | 0.762             |
| 2.712                          | 0.000 | 0.082 | 0.410           | 15.26               | 0.9506                       | 0.433             |
| 5.326                          | 0.000 | 0.438 | 0.732           | 30.44               | 0.4630                       | 0.271             |
| 8.390                          | 0.000 | 1.224 | 1.232           | 60.86               | 0.2030                       | 0.191             |
| 11.850                         | 0.000 | 2.335 | 1.977           | 121.67              | 0.0615                       | 0.149             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| 17.261                         | 0.000 | 3.789 | 3.065           | 242.67              | -0.0221                      | 0.123             |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |                   |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |                   |
| 33.147                         | 0.000 | 3.454 | 4.126           | 404.84              | 0.0076                       | 0.114             |
| 62.979                         | 0.000 | 3.630 | 5.413           | 663.12              | -0.0034                      | 0.108             |
| 117.964                        | 0.000 | 3.815 | 7.001           | 1074.99             | -0.0135                      | 0.105             |
| 223.663                        | 0.000 | 3.371 | 8.919           | 1715.22             | 0.0084                       | 0.103             |
| 432.273                        | 0.000 | 3.437 | 11.350          | 2747.60             | 0.0052                       | 0.102             |
| 861.830                        | 0.000 | 3.616 | 14.711          | 4582.91             | -0.0037                      | 0.101             |
| 1402.316                       | 0.000 | 3.579 | 19.328          | 7876.32             | -0.0018                      | 0.101             |
| 1407.629                       | 0.000 | 3.647 | 19.380          | 7916.33             | -0.0052                      | 0.101             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.2955 M ABOVE DISCHARGE PORT

AVG DILUTION = 197.1617 B = 2.69 M

MAXIMUM RISE (CENTER) = 4.4650 M ABOVE DISCHARGE PORT

AVG DILUTION = 310.0082 B = 3.57 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

.....

CASE NO. 10 JETLAG 2000

TITLE Jet10

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                          |   |                      |
|--------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS   | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT        | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR            | : | STANDARD             |
| TIME STEP CONTRL         | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS | : | 1500                 |
| PRINTOUT INTERVAL        | : | 100                  |

MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES

^^  

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj    | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 4.24E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | lm    | ... 2.8209 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb    | ... 4.2413 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 2.3006 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 53.0516          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 119.9239         |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0188           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0231           |
| Fd       | ... 40.73         | lm/lb | ... 0.6651           |
| Uj/Ua    | ... 53.05         | lM/lb | ... 0.5424           |

Coflowing case:

dMj ... 0.0781  
 lm\* ... 2.7942  
 Sm\* ... 52.0516

Stratification case:

T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 5.305    |
| -0.176                         | 0.000 | 0.000 | 0.059           | 1.95                | 7.5037                       | 2.631    |
| -0.531                         | 0.000 | 0.002 | 0.120           | 3.86                | 3.7781                       | 1.270    |
| -1.242                         | 0.000 | 0.015 | 0.249           | 7.66                | 1.8999                       | 0.588    |
| -2.637                         | 0.000 | 0.151 | 0.531           | 15.02               | 0.9630                       | 0.254    |
| -4.701                         | 0.000 | 1.125 | 1.053           | 28.36               | 0.4733                       | 0.122    |
| -5.140                         | 0.000 | 2.107 | 1.972           | 56.68               | 0.2031                       | 0.070    |
| -4.742                         | 0.000 | 2.729 | 2.786           | 113.23              | 0.0793                       | 0.070    |
| -2.721                         | 0.000 | 3.772 | 3.609           | 222.70              | 0.0014                       | 0.082    |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |          |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |          |
| 5.452                          | 0.000 | 4.698 | 4.538           | 372.34              | -0.0337                      | 0.086    |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |          |
| 25.727                         | 0.000 | 4.303 | 5.813           | 652.87              | -0.0151                      | 0.092    |
| 68.962                         | 0.000 | 3.736 | 7.233           | 1040.53             | 0.0137                       | 0.095    |
| 157.495                        | 0.000 | 3.898 | 8.985           | 1637.23             | 0.0056                       | 0.097    |
| 338.707                        | 0.000 | 4.124 | 11.315          | 2627.94             | -0.0056                      | 0.098    |
| 726.282                        | 0.000 | 4.011 | 14.469          | 4332.40             | 0.0001                       | 0.099    |
| 1256.312                       | 0.000 | 3.910 | 18.993          | 7502.29             | 0.0050                       | 0.099    |
| 1261.629                       | 0.000 | 3.942 | 19.026          | 7529.86             | 0.0035                       | 0.099    |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.8004 M ABOVE DISCHARGE PORT

AVG DILUTION = 225.9042 B = 3.63 M

MAXIMUM RISE (CENTER) = 4.8105 M ABOVE DISCHARGE PORT

AVG DILUTION = 363.5522 B = 4.50 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

**SIMULACIÓN 9**

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 1 JETLAG 2000  
TITLE Jet1

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.66E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 3.7613 (m)       |
| ua       | ... | 0.1000 (m/s)  | lb    | ... | 5.6551 (m)       |
| dp/pa    | ... | 0.02883       | lm    | ... | 3.0675 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 70.7355          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 159.8985         |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0141           |
| Hor. ang | ... | 90.00         | lQ/lm | ... | 0.0173           |
| Fd       | ... | 54.31         | lm/lb | ... | 0.6651           |
| Uj/ua    | ... | 70.74         | lm/lb | ... | 0.5424           |

Stratification case:  
T ... -4784.49

| X                              | Y      | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------------------------------|--------|-------|-----------------|---------------------|------------------------------|----------|
| (m)                            | (m)    | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000                          | 0.000  | 0.000 | 0.030           | 1.00                | 29.6379                      | 7.074    |
| 0.001                          | 0.178  | 0.000 | 0.059           | 1.95                | 7.5033                       | 3.574    |
| 0.011                          | 0.538  | 0.001 | 0.117           | 3.85                | 3.7904                       | 1.801    |
| 0.061                          | 1.266  | 0.008 | 0.231           | 7.63                | 1.9080                       | 0.908    |
| 0.229                          | 2.400  | 0.044 | 0.457           | 15.20               | 0.9559                       | 0.463    |
| 0.651                          | 3.782  | 0.172 | 0.881           | 30.33               | 0.4741                       | 0.249    |
| 1.526                          | 5.189  | 0.482 | 1.580           | 60.57               | 0.2260                       | 0.154    |
| 3.243                          | 6.559  | 1.105 | 2.537           | 120.94              | 0.0904                       | 0.120    |
| 6.827                          | 7.974  | 2.234 | 3.791           | 241.38              | 0.0041                       | 0.107    |
| NEUTRAL BUOYANCY LEVEL REACHED |        |       |                 |                     |                              |          |
| 16.641                         | 9.859  | 3.159 | 5.436           | 469.17              | -0.0274                      | 0.101    |
| TRAPPING LEVEL REACHED         |        |       |                 |                     |                              |          |
| 43.431                         | 12.588 | 2.917 | 7.582           | 904.56              | -0.0162                      | 0.100    |
| 111.489                        | 16.256 | 2.492 | 10.379          | 1693.45             | 0.0051                       | 0.100    |
| 282.776                        | 21.206 | 2.632 | 14.137          | 3139.69             | -0.0020                      | 0.100    |
| 715.152                        | 27.913 | 2.670 | 19.418          | 5921.99             | -0.0038                      | 0.100    |
| 1272.314                       | 32.796 | 2.654 | 25.968          | 10595.58            | -0.0032                      | 0.100    |
| 1813.458                       | 35.489 | 2.783 | 34.103          | 18267.98            | -0.0094                      | 0.100    |
| 1818.815                       | 35.509 | 2.690 | 34.140          | 18318.46            | -0.0050                      | 0.100    |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.3158 M ABOVE DISCHARGE PORT



AVG DILUTION = 251.4447 B = 3.88 M  
 MAXIMUM RISE (CENTER) = 3.2374 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 431.7774 B = 5.22 M  
 SURFACE LAYER (CENTER) LEVEL = 2.63 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 11177.29

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 2 JETLAG 2000  
 TITLE Jet2

#### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

#### ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

#### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0200 (m3/s) | Qj    | ... 2.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 1.41E-01 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 5.66E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| uj       | ... 7.0736 (m/s)  | lm    | ... 3.7613 (m)       |
| ua       | ... 0.1000 (m/s)  | lb    | ... 5.6551 (m)       |
| dp/pa    | ... 0.02883       | lm    | ... 3.0675 (m)       |
| po       | ... 0.99827(g/cc) | sm    | ... 70.7355          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 159.8985         |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0141           |
| Hor. ang | ... 180.00        | lQ/lm | ... 0.0173           |
| Fd       | ... 54.31         | lm/lb | ... 0.6651           |
| uj/ua    | ... 70.74         | lm/lb | ... 0.5424           |

Stratification case:  
 T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 7.074             |
| -0.177                         | 0.000 | 0.000 | 0.059           | 1.95                | 7.5036                       | 3.524             |
| -0.533                         | 0.000 | 0.001 | 0.120           | 3.86                | 3.7780                       | 1.719             |
| -1.244                         | 0.000 | 0.008 | 0.245           | 7.66                | 1.9000                       | 0.813             |
| -2.661                         | 0.000 | 0.079 | 0.519           | 15.23               | 0.9527                       | 0.360             |
| -5.364                         | 0.000 | 0.800 | 1.043           | 28.31               | 0.4832                       | 0.166             |
| -6.894                         | 0.000 | 2.383 | 2.109           | 56.69               | 0.1863                       | 0.081             |
| -6.752                         | 0.000 | 3.269 | 3.394           | 113.19              | 0.0627                       | 0.063             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| -5.232                         | 0.000 | 4.227 | 4.370           | 223.48              | -0.0039                      | 0.075             |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |                   |
| 2.870                          | 0.000 | 4.974 | 5.322           | 363.56              | -0.0293                      | 0.082             |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |                   |
| 23.346                         | 0.000 | 4.797 | 6.712           | 629.90              | -0.0219                      | 0.089             |
| 68.397                         | 0.000 | 4.184 | 8.193           | 981.13              | 0.0085                       | 0.093             |

|          |       |       |        |         |         |       |
|----------|-------|-------|--------|---------|---------|-------|
| 161.483  | 0.000 | 4.538 | 10.226 | 1569.87 | -0.0089 | 0.096 |
| 354.766  | 0.000 | 4.436 | 12.829 | 2514.10 | -0.0038 | 0.097 |
| 766.404  | 0.000 | 4.277 | 16.438 | 4173.70 | 0.0040  | 0.098 |
| 1294.827 | 0.000 | 4.419 | 21.239 | 7017.20 | -0.0030 | 0.099 |
| 1300.218 | 0.000 | 4.300 | 21.314 | 7067.07 | 0.0029  | 0.099 |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 4.1453 M ABOVE DISCHARGE PORT

AVG DILUTION = 214.1874 B = 4.30 M

MAXIMUM RISE (CENTER) = 5.1972 M ABOVE DISCHARGE PORT

AVG DILUTION = 350.5213 B = 5.28 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 3 JETLAG 2000

TITLE Jet3

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |   |                      |
|----------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS     | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : | STANDARD             |
| TIME STEP CONTRL           | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : | 1500                 |
| PRINTOUT INTERVAL          | : | 100                  |
| MAX NUMBER OF ITERATIONS   | : | 5                    |
| ITERATION ERROR BOUND      | : | 0.00100              |
| APPROX RATIO OF MASS/DMASS | : | 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         |          |       |       |        |        |
|---------|----------|-------|-------|--------|--------|
|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.66E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 3.7613 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 5.6551 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 3.0675 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 70.7355          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 159.8985         |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0141           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0173           |
| Fd       | ... | 54.31         | lm/lb | ... | 0.6651           |
| Uj/Ua    | ... | 70.74         | lM/lb | ... | 0.5424           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.1395  |
| lm* | ... | 3.7346  |
| Sm* | ... | 69.7355 |

Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

|       |       |       |                 |                     |                              |          |
|-------|-------|-------|-----------------|---------------------|------------------------------|----------|
| X     | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
| (m)   | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| ..... | ..... | ..... | .....           | .....               | .....                        | .....    |
| 0.000 | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 7.074    |
| 0.179 | 0.000 | 0.000 | 0.059           | 1.95                | 7.5029                       | 3.623    |
| 0.540 | 0.000 | 0.001 | 0.115           | 3.86                | 3.7769                       | 1.867    |
| 1.263 | 0.000 | 0.007 | 0.222           | 7.67                | 1.8988                       | 0.987    |
| 2.706 | 0.000 | 0.049 | 0.422           | 15.26               | 0.9519                       | 0.545    |

|                                |       |       |        |         |         |       |
|--------------------------------|-------|-------|--------|---------|---------|-------|
| 5.554                          | 0.000 | 0.310 | 0.770  | 30.40   | 0.4675  | 0.326 |
| 9.533                          | 0.000 | 1.124 | 1.330  | 60.76   | 0.2040  | 0.219 |
| 13.998                         | 0.000 | 2.428 | 2.180  | 121.48  | 0.0549  | 0.163 |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |        |         |         |       |
| 20.867                         | 0.000 | 4.133 | 3.443  | 241.80  | -0.0345 | 0.130 |
| MAXIMUM RISE REACHED           |       |       |        |         |         |       |
| TRAPPING LEVEL REACHED         |       |       |        |         |         |       |
| 39.733                         | 0.000 | 3.129 | 4.748  | 413.65  | 0.0263  | 0.117 |
| 75.181                         | 0.000 | 3.196 | 6.222  | 669.63  | 0.0214  | 0.110 |
| 139.872                        | 0.000 | 3.357 | 7.974  | 1062.66 | 0.0134  | 0.106 |
| 261.688                        | 0.000 | 3.456 | 10.187 | 1695.21 | 0.0085  | 0.104 |
| 502.440                        | 0.000 | 3.533 | 13.015 | 2727.21 | 0.0047  | 0.102 |
| 977.871                        | 0.000 | 3.622 | 17.029 | 4622.62 | 0.0003  | 0.101 |
| 1519.698                       | 0.000 | 3.753 | 22.283 | 7866.81 | -0.0061 | 0.101 |
| 1525.097                       | 0.000 | 3.701 | 22.318 | 7892.87 | -0.0037 | 0.101 |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.3322 M ABOVE DISCHARGE PORT

AVG DILUTION = 179.3414 B = 2.83 M

MAXIMUM RISE (CENTER) = 4.6136 M ABOVE DISCHARGE PORT

AVG DILUTION = 289.8933 B = 3.87 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 4 JETLAG 2000

TITLE Jet4

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |                        |
|----------------------------|------------------------|
| ENTRAINMENT HYPOTHESIS     | : ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : STANDARD             |
| TIME STEP CONTRL           | : VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : 1500                 |
| PRINTOUT INTERVAL          | : 100                  |
| MAX NUMBER OF ITERATIONS   | : 5                    |
| ITERATION ERROR BOUND      | : 0.00100              |
| APPROX RATIO OF MASS/DMASS | : 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0200 (m3/s) | Qj    | ... 2.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 1.41E-01 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 5.66E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 7.0736 (m/s)  | lm    | ... 3.7613 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb    | ... 5.6551 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 3.0675 (m)       |
| po       | ... 0.99827(g/cc) | sm    | ... 70.7355          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 159.8985         |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0141           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0173           |
| Fd       | ... 54.31         | lm/lb | ... 0.6651           |
| Uj/Ua    | ... 70.74         | lM/lb | ... 0.5424           |

Coflowing case:

|     |             |
|-----|-------------|
| dMj | ... 0.1395  |
| lm* | ... 3.7346  |
| sm* | ... 69.7355 |

Stratification case:

|   |              |
|---|--------------|
| T | ... -4784.49 |
|---|--------------|

| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 7.074             |
| -0.177                         | 0.000    | 0.000    | 0.059                  | 1.95                | 7.5036                       | 3.524             |
| -0.533                         | 0.000    | 0.001    | 0.120                  | 3.86                | 3.7780                       | 1.719             |
| -1.244                         | 0.000    | 0.008    | 0.245                  | 7.66                | 1.9000                       | 0.813             |
| -2.661                         | 0.000    | 0.079    | 0.519                  | 15.23               | 0.9527                       | 0.360             |
| -5.364                         | 0.000    | 0.800    | 1.043                  | 28.31               | 0.4832                       | 0.166             |
| -6.894                         | 0.000    | 2.383    | 2.109                  | 56.69               | 0.1863                       | 0.081             |
| -6.752                         | 0.000    | 3.269    | 3.394                  | 113.19              | 0.0627                       | 0.063             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| -5.232                         | 0.000    | 4.227    | 4.370                  | 223.48              | -0.0039                      | 0.075             |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| 2.870                          | 0.000    | 4.974    | 5.322                  | 363.56              | -0.0293                      | 0.082             |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 23.346                         | 0.000    | 4.797    | 6.712                  | 629.90              | -0.0219                      | 0.089             |
| 68.397                         | 0.000    | 4.184    | 8.193                  | 981.13              | 0.0085                       | 0.093             |
| 161.483                        | 0.000    | 4.538    | 10.226                 | 1569.87             | -0.0089                      | 0.096             |
| 354.766                        | 0.000    | 4.436    | 12.829                 | 2514.10             | -0.0038                      | 0.097             |
| 766.404                        | 0.000    | 4.277    | 16.438                 | 4173.70             | 0.0040                       | 0.098             |
| 1294.827                       | 0.000    | 4.419    | 21.239                 | 7017.20             | -0.0030                      | 0.099             |
| 1300.218                       | 0.000    | 4.300    | 21.314                 | 7067.07             | 0.0029                       | 0.099             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 4.1453 M ABOVE DISCHARGE PORT

AVG DILUTION = 214.1874 B = 4.30 M

MAXIMUM RISE (CENTER) = 5.1972 M ABOVE DISCHARGE PORT

AVG DILUTION = 350.5213 B = 5.28 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 5 JETLAG 2000  
TITLE Jet5

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0200 (m3/s) | Qj    | ... 2.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 1.41E-01 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 5.66E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 7.0736 (m/s)  | lm    | ... 3.7613 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb    | ... 5.6551 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 3.0675 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 70.7355          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 159.8985         |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0141           |
| Hor. ang | ... 0.00          | lQ/lM | ... 0.0173           |
| Fd       | ... 54.31         | lm/lb | ... 0.6651           |
| Uj/Ua    | ... 70.74         | lM/lb | ... 0.5424           |

Coflowing case:  
 dmj ... 0.1395  
 lm\* ... 3.7346  
 Sm\* ... 69.7355

Stratification case:  
 T ... -4784.49

| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 7.074             |
| 0.179                          | 0.000    | 0.000    | 0.059                  | 1.95                | 7.5029                       | 3.623             |
| 0.540                          | 0.000    | 0.001    | 0.115                  | 3.86                | 3.7769                       | 1.867             |
| 1.263                          | 0.000    | 0.007    | 0.222                  | 7.67                | 1.8988                       | 0.987             |
| 2.706                          | 0.000    | 0.049    | 0.422                  | 15.26               | 0.9519                       | 0.545             |
| 5.554                          | 0.000    | 0.310    | 0.770                  | 30.40               | 0.4675                       | 0.326             |
| 9.533                          | 0.000    | 1.124    | 1.330                  | 60.76               | 0.2040                       | 0.219             |
| 13.998                         | 0.000    | 2.428    | 2.180                  | 121.48              | 0.0549                       | 0.163             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| 20.867                         | 0.000    | 4.133    | 3.443                  | 241.80              | -0.0345                      | 0.130             |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 39.733                         | 0.000    | 3.129    | 4.748                  | 413.65              | 0.0263                       | 0.117             |
| 75.181                         | 0.000    | 3.196    | 6.222                  | 669.63              | 0.0214                       | 0.110             |
| 139.872                        | 0.000    | 3.357    | 7.974                  | 1062.66             | 0.0134                       | 0.106             |
| 261.688                        | 0.000    | 3.456    | 10.187                 | 1695.21             | 0.0085                       | 0.104             |
| 502.440                        | 0.000    | 3.533    | 13.015                 | 2727.21             | 0.0047                       | 0.102             |
| 977.871                        | 0.000    | 3.622    | 17.029                 | 4622.62             | 0.0003                       | 0.101             |
| 1519.698                       | 0.000    | 3.753    | 22.283                 | 7866.81             | -0.0061                      | 0.101             |
| 1525.097                       | 0.000    | 3.701    | 22.318                 | 7892.87             | -0.0037                      | 0.101             |

NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 3.3322 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 179.3414 B = 2.83 M  
 MAXIMUM RISE (CENTER) = 4.6136 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 289.8933 B = 3.87 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 6 JETLAG 2000  
 TITLE Jet6

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^  

|         |          |       |       |        |        |
|---------|----------|-------|-------|--------|--------|
|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^  
 Total Q ... 0.0200 (m3/s) Qj ... 2.00E-02 (m3/s)  
 Port No. ... 1 Mj ... 1.41E-01 (m4/s2)

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.66E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 3.7613 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 5.6551 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 3.0675 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 70.7355          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 159.8985         |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0141           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0173           |
| Fd       | ... | 54.31         | lm/lb | ... | 0.6651           |
| Uj/Ua    | ... | 70.74         | lM/lb | ... | 0.5424           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.1395  |
| lm* | ... | 3.7346  |
| Sm* | ... | 69.7355 |

Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 7.074             |
| -0.177                         | 0.000 | 0.000 | 0.059           | 1.95                | 7.5036                       | 3.524             |
| -0.533                         | 0.000 | 0.001 | 0.120           | 3.86                | 3.7780                       | 1.719             |
| -1.244                         | 0.000 | 0.008 | 0.245           | 7.66                | 1.9000                       | 0.813             |
| -2.661                         | 0.000 | 0.079 | 0.519           | 15.23               | 0.9527                       | 0.360             |
| -5.364                         | 0.000 | 0.800 | 1.043           | 28.31               | 0.4832                       | 0.166             |
| -6.894                         | 0.000 | 2.383 | 2.109           | 56.69               | 0.1863                       | 0.081             |
| -6.752                         | 0.000 | 3.269 | 3.394           | 113.19              | 0.0627                       | 0.063             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| -5.232                         | 0.000 | 4.227 | 4.370           | 223.48              | -0.0039                      | 0.075             |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |                   |
| 2.870                          | 0.000 | 4.974 | 5.322           | 363.56              | -0.0293                      | 0.082             |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |                   |
| 23.346                         | 0.000 | 4.797 | 6.712           | 629.90              | -0.0219                      | 0.089             |
| 68.397                         | 0.000 | 4.184 | 8.193           | 981.13              | 0.0085                       | 0.093             |
| 161.483                        | 0.000 | 4.538 | 10.226          | 1569.87             | -0.0089                      | 0.096             |
| 354.766                        | 0.000 | 4.436 | 12.829          | 2514.10             | -0.0038                      | 0.097             |
| 766.404                        | 0.000 | 4.277 | 16.438          | 4173.70             | 0.0040                       | 0.098             |
| 1294.827                       | 0.000 | 4.419 | 21.239          | 7017.20             | -0.0030                      | 0.099             |
| 1300.218                       | 0.000 | 4.300 | 21.314          | 7067.07             | 0.0029                       | 0.099             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 4.1453 M ABOVE DISCHARGE PORT

AVG DILUTION = 214.1874 B = 4.30 M

MAXIMUM RISE (CENTER) = 5.1972 M ABOVE DISCHARGE PORT

AVG DILUTION = 350.5213 B = 5.28 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

|          |      |             |
|----------|------|-------------|
| CASE NO. | 7    | JETLAG 2000 |
| TITLE    | Jet7 |             |

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |                        |
|----------------------------|------------------------|
| ENTRAINMENT HYPOTHESIS     | : ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : STANDARD             |
| TIME STEP CONTRL           | : VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : 1500                 |
| PRINTOUT INTERVAL          | : 100                  |
| MAX NUMBER OF ITERATIONS   | : 5                    |
| ITERATION ERROR BOUND      | : 0.00100              |
| APPROX RATIO OF MASS/DMASS | : 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         |          |       |       |        |        |
|---------|----------|-------|-------|--------|--------|
|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.66E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 3.7613 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 5.6551 (m)       |
| dp/pa    | ... | 0.02883       | lm    | ... | 3.0675 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 70.7355          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 159.8985         |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0141           |
| Hor. ang | ... | 0.00          | lQ/lm | ... | 0.0173           |
| Fd       | ... | 54.31         | lm/lb | ... | 0.6651           |
| Uj/Ua    | ... | 70.74         | lm/lb | ... | 0.5424           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.1395  |
| lm* | ... | 3.7346  |
| Sm* | ... | 69.7355 |

Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 7.074             |
| 0.179                          | 0.000 | 0.000 | 0.059           | 1.95                | 7.5029                       | 3.623             |
| 0.540                          | 0.000 | 0.001 | 0.115           | 3.86                | 3.7769                       | 1.867             |
| 1.263                          | 0.000 | 0.007 | 0.222           | 7.67                | 1.8988                       | 0.987             |
| 2.706                          | 0.000 | 0.049 | 0.422           | 15.26               | 0.9519                       | 0.545             |
| 5.554                          | 0.000 | 0.310 | 0.770           | 30.40               | 0.4675                       | 0.326             |
| 9.533                          | 0.000 | 1.124 | 1.330           | 60.76               | 0.2040                       | 0.219             |
| 13.998                         | 0.000 | 2.428 | 2.180           | 121.48              | 0.0549                       | 0.163             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| 20.867                         | 0.000 | 4.133 | 3.443           | 241.80              | -0.0345                      | 0.130             |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |                   |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |                   |
| 39.733                         | 0.000 | 3.129 | 4.748           | 413.65              | 0.0263                       | 0.117             |
| 75.181                         | 0.000 | 3.196 | 6.222           | 669.63              | 0.0214                       | 0.110             |
| 139.872                        | 0.000 | 3.357 | 7.974           | 1062.66             | 0.0134                       | 0.106             |
| 261.688                        | 0.000 | 3.456 | 10.187          | 1695.21             | 0.0085                       | 0.104             |
| 502.440                        | 0.000 | 3.533 | 13.015          | 2727.21             | 0.0047                       | 0.102             |
| 977.871                        | 0.000 | 3.622 | 17.029          | 4622.62             | 0.0003                       | 0.101             |
| 1519.698                       | 0.000 | 3.753 | 22.283          | 7866.81             | -0.0061                      | 0.101             |
| 1525.097                       | 0.000 | 3.701 | 22.318          | 7892.87             | -0.0037                      | 0.101             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.3322 M ABOVE DISCHARGE PORT

AVG DILUTION = 179.3414 B = 2.83 M

MAXIMUM RISE (CENTER) = 4.6136 M ABOVE DISCHARGE PORT

AVG DILUTION = 289.8933 B = 3.87 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

.....

CASE NO. 8 JETLAG 2000

TITLE Jet8

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC

SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.66E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 3.7613 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 5.6551 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 3.0675 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 70.7355          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 159.8985         |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0141           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0173           |
| Fd       | ... | 54.31         | lm/lb | ... | 0.6651           |
| Uj/Ua    | ... | 70.74         | lM/lb | ... | 0.5424           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.1395  |
| lm* | ... | 3.7346  |
| Sm* | ... | 69.7355 |

Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 7.074             |
| -0.177                         | 0.000    | 0.000    | 0.059                  | 1.95                | 7.5036                       | 3.524             |
| -0.533                         | 0.000    | 0.001    | 0.120                  | 3.86                | 3.7780                       | 1.719             |
| -1.244                         | 0.000    | 0.008    | 0.245                  | 7.66                | 1.9000                       | 0.813             |
| -2.661                         | 0.000    | 0.079    | 0.519                  | 15.23               | 0.9527                       | 0.360             |
| -5.364                         | 0.000    | 0.800    | 1.043                  | 28.31               | 0.4832                       | 0.166             |
| -6.894                         | 0.000    | 2.383    | 2.109                  | 56.69               | 0.1863                       | 0.081             |
| -6.752                         | 0.000    | 3.269    | 3.394                  | 113.19              | 0.0627                       | 0.063             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| -5.232                         | 0.000    | 4.227    | 4.370                  | 223.48              | -0.0039                      | 0.075             |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| 2.870                          | 0.000    | 4.974    | 5.322                  | 363.56              | -0.0293                      | 0.082             |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 23.346                         | 0.000    | 4.797    | 6.712                  | 629.90              | -0.0219                      | 0.089             |
| 68.397                         | 0.000    | 4.184    | 8.193                  | 981.13              | 0.0085                       | 0.093             |
| 161.483                        | 0.000    | 4.538    | 10.226                 | 1569.87             | -0.0089                      | 0.096             |
| 354.766                        | 0.000    | 4.436    | 12.829                 | 2514.10             | -0.0038                      | 0.097             |
| 766.404                        | 0.000    | 4.277    | 16.438                 | 4173.70             | 0.0040                       | 0.098             |
| 1294.827                       | 0.000    | 4.419    | 21.239                 | 7017.20             | -0.0030                      | 0.099             |
| 1300.218                       | 0.000    | 4.300    | 21.314                 | 7067.07             | 0.0029                       | 0.099             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 4.1453 M ABOVE DISCHARGE PORT

AVG DILUTION = 214.1874 B = 4.30 M

MAXIMUM RISE (CENTER) = 5.1972 M ABOVE DISCHARGE PORT

AVG DILUTION = 350.5213 B = 5.28 M



COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 9 JETLAG 2000  
 TITLE Jet9

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.100  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^  

|          |                    |       |                      |
|----------|--------------------|-------|----------------------|
| Total Q  | ... 0.0200 (m3/s)  | Qj    | ... 2.00E-02 (m3/s)  |
| Port No. | ... 1              | Mj    | ... 1.41E-01 (m4/s2) |
| Depth    | ... 29.3000 (m)    | Bj    | ... 5.66E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)     | lQ    | ... 0.0532 (m)       |
| Uj       | ... 7.0736 (m/s)   | lm    | ... 3.7613 (m)       |
| Ua       | ... 0.1000 (m/s)   | lb    | ... 5.6551 (m)       |
| dp/pa    | ... 0.02883        | lM    | ... 3.0675 (m)       |
| po       | ... 0.99827 (g/cc) | Sm    | ... 70.7355          |
| pa       | ... 1.02790 (g/cc) | Sb    | ... 159.8985         |
| Ver. ang | ... 0.00           | lQ/lm | ... 0.0141           |
| Hor. ang | ... 0.00           | lQ/lM | ... 0.0173           |
| Fd       | ... 54.31          | lm/lb | ... 0.6651           |
| Uj/Ua    | ... 70.74          | lM/lb | ... 0.5424           |

Coflowing case:  
 dmj ... 0.1395  
 lm\* ... 3.7346  
 Sm\* ... 69.7355

Stratification case:  
 T ... -4784.49

| X                              | Y     | Z     | PLUME RADIUS | AVERAGE DILUTION | DENSITY DIFF. | VELOCITY |
|--------------------------------|-------|-------|--------------|------------------|---------------|----------|
| (m)                            | (m)   | (m)   | (m)          |                  | (sigmat)      | (m/s)    |
| 0.000                          | 0.000 | 0.000 | 0.030        | 1.00             | 29.6379       | 7.074    |
| 0.179                          | 0.000 | 0.000 | 0.059        | 1.95             | 7.5029        | 3.623    |
| 0.540                          | 0.000 | 0.001 | 0.115        | 3.86             | 3.7769        | 1.867    |
| 1.263                          | 0.000 | 0.007 | 0.222        | 7.67             | 1.8988        | 0.987    |
| 2.706                          | 0.000 | 0.049 | 0.422        | 15.26            | 0.9519        | 0.545    |
| 5.554                          | 0.000 | 0.310 | 0.770        | 30.40            | 0.4675        | 0.326    |
| 9.533                          | 0.000 | 1.124 | 1.330        | 60.76            | 0.2040        | 0.219    |
| 13.998                         | 0.000 | 2.428 | 2.180        | 121.48           | 0.0549        | 0.163    |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |              |                  |               |          |
| 20.867                         | 0.000 | 4.133 | 3.443        | 241.80           | -0.0345       | 0.130    |
| MAXIMUM RISE REACHED           |       |       |              |                  |               |          |
| TRAPPING LEVEL REACHED         |       |       |              |                  |               |          |
| 39.733                         | 0.000 | 3.129 | 4.748        | 413.65           | 0.0263        | 0.117    |
| 75.181                         | 0.000 | 3.196 | 6.222        | 669.63           | 0.0214        | 0.110    |
| 139.872                        | 0.000 | 3.357 | 7.974        | 1062.66          | 0.0134        | 0.106    |
| 261.688                        | 0.000 | 3.456 | 10.187       | 1695.21          | 0.0085        | 0.104    |
| 502.440                        | 0.000 | 3.533 | 13.015       | 2727.21          | 0.0047        | 0.102    |



|                                |       |       |        |         |         |       |
|--------------------------------|-------|-------|--------|---------|---------|-------|
| -6.752                         | 0.000 | 3.269 | 3.394  | 113.19  | 0.0627  | 0.063 |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |        |         |         |       |
| -5.232                         | 0.000 | 4.227 | 4.370  | 223.48  | -0.0039 | 0.075 |
| MAXIMUM RISE REACHED           |       |       |        |         |         |       |
| 2.870                          | 0.000 | 4.974 | 5.322  | 363.56  | -0.0293 | 0.082 |
| TRAPPING LEVEL REACHED         |       |       |        |         |         |       |
| 23.346                         | 0.000 | 4.797 | 6.712  | 629.90  | -0.0219 | 0.089 |
| 68.397                         | 0.000 | 4.184 | 8.193  | 981.13  | 0.0085  | 0.093 |
| 161.483                        | 0.000 | 4.538 | 10.226 | 1569.87 | -0.0089 | 0.096 |
| 354.766                        | 0.000 | 4.436 | 12.829 | 2514.10 | -0.0038 | 0.097 |
| 766.404                        | 0.000 | 4.277 | 16.438 | 4173.70 | 0.0040  | 0.098 |
| 1294.827                       | 0.000 | 4.419 | 21.239 | 7017.20 | -0.0030 | 0.099 |
| 1300.218                       | 0.000 | 4.300 | 21.314 | 7067.07 | 0.0029  | 0.099 |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 4.1453 M ABOVE DISCHARGE PORT

AVG DILUTION = 214.1874 B = 4.30 M

MAXIMUM RISE (CENTER) = 5.1972 M ABOVE DISCHARGE PORT

AVG DILUTION = 350.5213 B = 5.28 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

### SIMULACIÓN 10

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 1 JETLAG 2000

TITLE Jet1

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |                        |
|----------------------------|------------------------|
| ENTRAINMENT HYPOTHESIS     | : ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : STANDARD             |
| TIME STEP CONTRL           | : VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : 1500                 |
| PRINTOUT INTERVAL          | : 100                  |
| MAX NUMBER OF ITERATIONS   | : 5                    |
| ITERATION ERROR BOUND      | : 0.00100              |
| APPROX RATIO OF MASS/DMASS | : 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0100 (m3/s) | Qj    | ... 1.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 3.54E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 2.83E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 3.5368 (m/s)  | lm    | ... 0.9403 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.3534 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 1.5337 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 17.6839          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 2.4984           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0565           |
| Hor. ang | ... 90.00         | lQ/lM | ... 0.0347           |
| Fd       | ... 27.15         | lm/lb | ... 2.6605           |
| Uj/Ua    | ... 17.68         | lM/lb | ... 4.3395           |

Stratification case:

T ... -4784.49

| X | Y | Z | PLUME | AVERAGE | DENSITY | VELOCITY |
|---|---|---|-------|---------|---------|----------|
|---|---|---|-------|---------|---------|----------|

| (m)                            | (m)    | (m)   | RADIUS<br>(m) | DILUTION | DIFF.<br>(sigmat) | (m/s) |
|--------------------------------|--------|-------|---------------|----------|-------------------|-------|
| 0.000                          | 0.000  | 0.000 | 0.030         | 1.00     | 29.6379           | 3.537 |
| 0.005                          | 0.182  | 0.000 | 0.059         | 1.95     | 7.5004            | 1.789 |
| 0.036                          | 0.468  | 0.002 | 0.116         | 3.87     | 3.7711            | 0.907 |
| 0.129                          | 0.818  | 0.010 | 0.226         | 7.69     | 1.8919            | 0.481 |
| 0.337                          | 1.172  | 0.030 | 0.408         | 15.35    | 0.9473            | 0.293 |
| 0.733                          | 1.494  | 0.068 | 0.659         | 30.61    | 0.4734            | 0.225 |
| 1.772                          | 1.900  | 0.174 | 0.971         | 60.97    | 0.2337            | 0.206 |
| 4.503                          | 2.436  | 0.502 | 1.384         | 121.60   | 0.1049            | 0.202 |
| 10.129                         | 2.992  | 1.216 | 1.960         | 242.82   | 0.0265            | 0.201 |
| NEUTRAL BUOYANCY LEVEL REACHED |        |       |               |          |                   |       |
| 23.188                         | 3.619  | 2.278 | 2.763         | 479.46   | -0.0249           | 0.200 |
| MAXIMUM RISE REACHED           |        |       |               |          |                   |       |
| TRAPPING LEVEL REACHED         |        |       |               |          |                   |       |
| 60.668                         | 4.605  | 1.531 | 3.702         | 860.21   | 0.0162            | 0.200 |
| 144.101                        | 5.811  | 2.051 | 4.963         | 1546.86  | -0.0094           | 0.200 |
| 330.913                        | 7.348  | 1.901 | 6.533         | 2680.85  | -0.0019           | 0.200 |
| 751.538                        | 9.343  | 1.841 | 8.605         | 4651.74  | 0.0010            | 0.200 |
| 1676.924                       | 11.877 | 1.916 | 11.455        | 8244.29  | -0.0027           | 0.200 |
| 2771.151                       | 13.629 | 1.933 | 15.099        | 14323.29 | -0.0035           | 0.200 |
| 2781.898                       | 13.642 | 1.931 | 15.131        | 14384.21 | -0.0035           | 0.200 |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 1.6731 M ABOVE DISCHARGE PORT

AVG DILUTION = 332.5478 B = 2.30 M

MAXIMUM RISE (CENTER) = 2.3851 M ABOVE DISCHARGE PORT

AVG DILUTION = 531.4107 B = 2.91 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 2 JETLAG 2000  
TITLE Jet2

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0100 (m3/s) | Qj    | ... 1.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 3.54E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 2.83E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 3.5368 (m/s)  | lm    | ... 0.9403 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.3534 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 1.5337 (m)       |
| po       | ... 0.99827(g/cc) | sm    | ... 17.6839          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 2.4984           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0565           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0347           |
| Fd       | ... 27.15         | lm/lb | ... 2.6605           |
| Uj/Ua    | ... 17.68         | lM/lb | ... 4.3395           |

Stratification case:

T ... -4784.49

| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 3.537             |
| -0.173                         | 0.000    | 0.000    | 0.061                  | 1.95                | 7.5047                       | 1.688             |
| -0.522                         | 0.000    | 0.004    | 0.128                  | 3.85                | 3.7839                       | 0.749             |
| -1.180                         | 0.000    | 0.043    | 0.278                  | 7.31                | 1.9907                       | 0.301             |
| -2.100                         | 0.000    | 0.337    | 0.517                  | 11.61               | 1.2402                       | 0.138             |
| -2.280                         | 0.000    | 0.563    | 0.839                  | 17.13               | 0.8317                       | 0.077             |
| -2.139                         | 0.000    | 0.744    | 0.999                  | 31.46               | 0.4458                       | 0.100             |
| -1.149                         | 0.000    | 1.146    | 1.153                  | 61.95               | 0.2117                       | 0.148             |
| 1.259                          | 0.000    | 1.755    | 1.502                  | 123.73              | 0.0839                       | 0.174             |
| 6.365                          | 0.000    | 2.626    | 2.050                  | 247.02              | 0.0104                       | 0.187             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| 21.498                         | 0.000    | 3.643    | 2.719                  | 445.49              | -0.0328                      | 0.192             |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 58.538                         | 0.000    | 2.782    | 3.493                  | 748.65              | 0.0108                       | 0.195             |
| 130.483                        | 0.000    | 3.218    | 4.523                  | 1266.79             | -0.0102                      | 0.197             |
| 275.557                        | 0.000    | 2.875    | 5.692                  | 2017.64             | 0.0069                       | 0.198             |
| 563.189                        | 0.000    | 2.937    | 7.157                  | 3200.32             | 0.0038                       | 0.199             |
| 1148.433                       | 0.000    | 3.035    | 9.046                  | 5123.67             | -0.0010                      | 0.199             |
| 1156.797                       | 0.000    | 2.986    | 9.078                  | 5159.35             | 0.0014                       | 0.199             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.8238 M ABOVE DISCHARGE PORT

AVG DILUTION = 280.8942 B = 2.18 M

MAXIMUM RISE (CENTER) = 3.6436 M ABOVE DISCHARGE PORT

AVG DILUTION = 445.5409 B = 2.72 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 3 JETLAG 2000  
TITLE Jet3

#### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

#### ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

#### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.83E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 0.9403 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.3534 (m)       |
| dp/pa    | ... | 0.02883       | lm    | ... | 1.5337 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 17.6839          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 2.4984           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0565           |

Hor. ang ... 0.00  
Fd ... 27.15  
Uj/Ua ... 17.68

lq/lm ... 0.0347  
lm/lb ... 2.6605  
lM/lb ... 4.3395

Coflowing case:

dMj ... 0.0334  
lm\* ... 0.9133  
sm\* ... 16.6839

Stratification case:

T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 3.537    |
| 0.183                          | 0.000 | 0.000 | 0.057           | 1.95                | 7.5019                       | 1.886    |
| 0.554                          | 0.000 | 0.003 | 0.108           | 3.86                | 3.7754                       | 1.045    |
| 1.300                          | 0.000 | 0.022 | 0.198           | 7.67                | 1.8968                       | 0.624    |
| 2.758                          | 0.000 | 0.119 | 0.343           | 15.29               | 0.9476                       | 0.414    |
| 4.629                          | 0.000 | 0.347 | 0.561           | 30.54               | 0.4660                       | 0.309    |
| 6.981                          | 0.000 | 0.709 | 0.871           | 61.03               | 0.2201                       | 0.256    |
| 10.298                         | 0.000 | 1.226 | 1.302           | 121.94              | 0.0915                       | 0.229    |
| 15.879                         | 0.000 | 1.972 | 1.900           | 243.53              | 0.0188                       | 0.215    |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |          |
| 30.730                         | 0.000 | 3.035 | 2.652           | 457.74              | -0.0300                      | 0.207    |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |          |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |          |
| 69.974                         | 0.000 | 2.139 | 3.375           | 731.72              | 0.0159                       | 0.204    |
| 144.774                        | 0.000 | 2.625 | 4.432           | 1250.61             | -0.0081                      | 0.203    |
| 291.843                        | 0.000 | 2.361 | 5.612           | 1994.77             | 0.0052                       | 0.202    |
| 580.082                        | 0.000 | 2.454 | 7.063           | 3150.98             | 0.0007                       | 0.201    |
| 1162.325                       | 0.000 | 2.520 | 8.963           | 5064.27             | -0.0027                      | 0.201    |
| 2196.100                       | 0.000 | 2.522 | 11.737          | 8671.64             | -0.0027                      | 0.200    |
| 2207.010                       | 0.000 | 2.464 | 11.773          | 8725.00             | 0.0001                       | 0.200    |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.3087 M ABOVE DISCHARGE PORT

AVG DILUTION = 309.2886 B = 2.16 M

MAXIMUM RISE (CENTER) = 3.0735 M ABOVE DISCHARGE PORT

AVG DILUTION = 466.2746 B = 2.68 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 4 JETLAG 2000  
TITLE Jet4

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.83E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 0.9403 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.3534 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 1.5337 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 17.6839          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 2.4984           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0565           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0347           |
| Fd       | ... | 27.15         | lm/lb | ... | 2.6605           |
| Uj/Ua    | ... | 17.68         | lM/lb | ... | 4.3395           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0334  |
| lm* | ... | 0.9133  |
| sm* | ... | 16.6839 |

Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 3.537             |
| -0.173                         | 0.000 | 0.000 | 0.061           | 1.95                | 7.5047                       | 1.688             |
| -0.522                         | 0.000 | 0.004 | 0.128           | 3.85                | 3.7839                       | 0.749             |
| -1.180                         | 0.000 | 0.043 | 0.278           | 7.31                | 1.9907                       | 0.301             |
| -2.100                         | 0.000 | 0.337 | 0.517           | 11.61               | 1.2402                       | 0.138             |
| -2.280                         | 0.000 | 0.563 | 0.839           | 17.13               | 0.8317                       | 0.077             |
| -2.139                         | 0.000 | 0.744 | 0.999           | 31.46               | 0.4458                       | 0.100             |
| -1.149                         | 0.000 | 1.146 | 1.153           | 61.95               | 0.2117                       | 0.148             |
| 1.259                          | 0.000 | 1.755 | 1.502           | 123.73              | 0.0839                       | 0.174             |
| 6.365                          | 0.000 | 2.626 | 2.050           | 247.02              | 0.0104                       | 0.187             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| 21.498                         | 0.000 | 3.643 | 2.719           | 445.49              | -0.0328                      | 0.192             |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |                   |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |                   |
| 58.538                         | 0.000 | 2.782 | 3.493           | 748.65              | 0.0108                       | 0.195             |
| 130.483                        | 0.000 | 3.218 | 4.523           | 1266.79             | -0.0102                      | 0.197             |
| 275.557                        | 0.000 | 2.875 | 5.692           | 2017.64             | 0.0069                       | 0.198             |
| 563.189                        | 0.000 | 2.937 | 7.157           | 3200.32             | 0.0038                       | 0.199             |
| 1148.433                       | 0.000 | 3.035 | 9.046           | 5123.67             | -0.0010                      | 0.199             |
| 1156.797                       | 0.000 | 2.986 | 9.078           | 5159.35             | 0.0014                       | 0.199             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.8238 M ABOVE DISCHARGE PORT

AVG DILUTION = 280.8942 B = 2.18 M

MAXIMUM RISE (CENTER) = 3.6436 M ABOVE DISCHARGE PORT

AVG DILUTION = 445.5409 B = 2.72 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

|          |      |             |
|----------|------|-------------|
| CASE NO. | 5    | JETLAG 2000 |
| TITLE    | Jet5 |             |

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                          |                        |
|--------------------------|------------------------|
| ENTRAINMENT HYPOTHESIS   | : ASYMMETRIC           |
| SHEAR ENTRAINMENT        | : VARIABLE (0 - 0.085) |
| COFLOW FACTOR            | : STANDARD             |
| TIME STEP CONTRL         | : VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS | : 1500                 |

|                            |           |
|----------------------------|-----------|
| PRINTOUT INTERVAL          | : 100     |
| MAX NUMBER OF ITERATIONS   | : 5       |
| ITERATION ERROR BOUND      | : 0.00100 |
| APPROX RATIO OF MASS/DMASS | : 144.0   |

# ENVIROMENTAL CONDITIONS

^^

|         |          |       |       |        |        |
|---------|----------|-------|-------|--------|--------|
|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| .....   | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
| AMBIENT | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

# LENGTH & DILUTION SCALES

^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.83E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 0.9403 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.3534 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 1.5337 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 17.6839          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 2.4984           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0565           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0347           |
| Fd       | ... | 27.15         | lm/lb | ... | 2.6605           |
| Uj/Ua    | ... | 17.68         | lM/lb | ... | 4.3395           |

## Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0334  |
| lm* | ... | 0.9133  |
| Sm* | ... | 16.6839 |

## Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

| X      | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)    | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000  | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 3.537             |
| 0.183  | 0.000 | 0.000 | 0.057           | 1.95                | 7.5019                       | 1.886             |
| 0.554  | 0.000 | 0.003 | 0.108           | 3.86                | 3.7754                       | 1.045             |
| 1.300  | 0.000 | 0.022 | 0.198           | 7.67                | 1.8968                       | 0.624             |
| 2.758  | 0.000 | 0.119 | 0.343           | 15.29               | 0.9476                       | 0.414             |
| 4.629  | 0.000 | 0.347 | 0.561           | 30.54               | 0.4660                       | 0.309             |
| 6.981  | 0.000 | 0.709 | 0.871           | 61.03               | 0.2201                       | 0.256             |
| 10.298 | 0.000 | 1.226 | 1.302           | 121.94              | 0.0915                       | 0.229             |
| 15.879 | 0.000 | 1.972 | 1.900           | 243.53              | 0.0188                       | 0.215             |

## NEUTRAL BUOYANCY LEVEL REACHED

|        |       |       |       |        |         |       |
|--------|-------|-------|-------|--------|---------|-------|
| 30.730 | 0.000 | 3.035 | 2.652 | 457.74 | -0.0300 | 0.207 |
|--------|-------|-------|-------|--------|---------|-------|

## MAXIMUM RISE REACHED

## TRAPPING LEVEL REACHED

|          |       |       |        |         |         |       |
|----------|-------|-------|--------|---------|---------|-------|
| 69.974   | 0.000 | 2.139 | 3.375  | 731.72  | 0.0159  | 0.204 |
| 144.774  | 0.000 | 2.625 | 4.432  | 1250.61 | -0.0081 | 0.203 |
| 291.843  | 0.000 | 2.361 | 5.612  | 1994.77 | 0.0052  | 0.202 |
| 580.082  | 0.000 | 2.454 | 7.063  | 3150.98 | 0.0007  | 0.201 |
| 1162.325 | 0.000 | 2.520 | 8.963  | 5064.27 | -0.0027 | 0.201 |
| 2196.100 | 0.000 | 2.522 | 11.737 | 8671.64 | -0.0027 | 0.200 |
| 2207.010 | 0.000 | 2.464 | 11.773 | 8725.00 | 0.0001  | 0.200 |

## NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.3087 M ABOVE DISCHARGE PORT

AVG DILUTION = 309.2886 B = 2.16 M

MAXIMUM RISE (CENTER) = 3.0735 M ABOVE DISCHARGE PORT

AVG DILUTION = 466.2746 B = 2.68 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

|          |   |             |
|----------|---|-------------|
| CASE NO. | 6 | JETLAG 2000 |
|----------|---|-------------|

TITLE Jet6



# INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

## ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

## LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.83E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 0.9403 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.3534 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 1.5337 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 17.6839          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 2.4984           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0565           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0347           |
| Fd       | ... | 27.15         | lm/lb | ... | 2.6605           |
| Uj/Ua    | ... | 17.68         | lM/lb | ... | 4.3395           |

### Coflowing case:

dMj ... 0.0334  
 lm\* ... 0.9133  
 Sm\* ... 16.6839

### Stratification case:

T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 3.537    |
| -0.173                         | 0.000 | 0.000 | 0.061           | 1.95                | 7.5047                       | 1.688    |
| -0.522                         | 0.000 | 0.004 | 0.128           | 3.85                | 3.7839                       | 0.749    |
| -1.180                         | 0.000 | 0.043 | 0.278           | 7.31                | 1.9907                       | 0.301    |
| -2.100                         | 0.000 | 0.337 | 0.517           | 11.61               | 1.2402                       | 0.138    |
| -2.280                         | 0.000 | 0.563 | 0.839           | 17.13               | 0.8317                       | 0.077    |
| -2.139                         | 0.000 | 0.744 | 0.999           | 31.46               | 0.4458                       | 0.100    |
| -1.149                         | 0.000 | 1.146 | 1.153           | 61.95               | 0.2117                       | 0.148    |
| 1.259                          | 0.000 | 1.755 | 1.502           | 123.73              | 0.0839                       | 0.174    |
| 6.365                          | 0.000 | 2.626 | 2.050           | 247.02              | 0.0104                       | 0.187    |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |          |
| 21.498                         | 0.000 | 3.643 | 2.719           | 445.49              | -0.0328                      | 0.192    |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |          |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |          |
| 58.538                         | 0.000 | 2.782 | 3.493           | 748.65              | 0.0108                       | 0.195    |
| 130.483                        | 0.000 | 3.218 | 4.523           | 1266.79             | -0.0102                      | 0.197    |
| 275.557                        | 0.000 | 2.875 | 5.692           | 2017.64             | 0.0069                       | 0.198    |
| 563.189                        | 0.000 | 2.937 | 7.157           | 3200.32             | 0.0038                       | 0.199    |
| 1148.433                       | 0.000 | 3.035 | 9.046           | 5123.67             | -0.0010                      | 0.199    |
| 1156.797                       | 0.000 | 2.986 | 9.078           | 5159.35             | 0.0014                       | 0.199    |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.8238 M ABOVE DISCHARGE PORT

AVG DILUTION = 280.8942 B = 2.18 M  
 MAXIMUM RISE (CENTER) = 3.6436 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 445.5409 B = 2.72 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 7 JETLAG 2000  
 TITLE Jet7

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0100 (m3/s) | Qj    | ... 1.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 3.54E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 2.83E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 3.5368 (m/s)  | lm    | ... 0.9403 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.3534 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 1.5337 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 17.6839          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 2.4984           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0565           |
| Hor. ang | ... 0.00          | lQ/lM | ... 0.0347           |
| Fd       | ... 27.15         | lm/lb | ... 2.6605           |
| Uj/Ua    | ... 17.68         | lM/lb | ... 4.3395           |

Coflowing case:

dmj ... 0.0334  
 lm\* ... 0.9133  
 Sm\* ... 16.6839

Stratification case:

T ... -4784.49

| X                              | Y     | Z     | PLUME RADIUS | AVERAGE DILUTION | DENSITY DIFF. | VELOCITY |
|--------------------------------|-------|-------|--------------|------------------|---------------|----------|
| (m)                            | (m)   | (m)   | (m)          |                  | (sigmat)      | (m/s)    |
| 0.000                          | 0.000 | 0.000 | 0.030        | 1.00             | 29.6379       | 3.537    |
| 0.183                          | 0.000 | 0.000 | 0.057        | 1.95             | 7.5019        | 1.886    |
| 0.554                          | 0.000 | 0.003 | 0.108        | 3.86             | 3.7754        | 1.045    |
| 1.300                          | 0.000 | 0.022 | 0.198        | 7.67             | 1.8968        | 0.624    |
| 2.758                          | 0.000 | 0.119 | 0.343        | 15.29            | 0.9476        | 0.414    |
| 4.629                          | 0.000 | 0.347 | 0.561        | 30.54            | 0.4660        | 0.309    |
| 6.981                          | 0.000 | 0.709 | 0.871        | 61.03            | 0.2201        | 0.256    |
| 10.298                         | 0.000 | 1.226 | 1.302        | 121.94           | 0.0915        | 0.229    |
| 15.879                         | 0.000 | 1.972 | 1.900        | 243.53           | 0.0188        | 0.215    |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |              |                  |               |          |
| 30.730                         | 0.000 | 3.035 | 2.652        | 457.74           | -0.0300       | 0.207    |
| MAXIMUM RISE REACHED           |       |       |              |                  |               |          |
| TRAPPING LEVEL REACHED         |       |       |              |                  |               |          |

|          |       |       |        |         |         |       |
|----------|-------|-------|--------|---------|---------|-------|
| 69.974   | 0.000 | 2.139 | 3.375  | 731.72  | 0.0159  | 0.204 |
| 144.774  | 0.000 | 2.625 | 4.432  | 1250.61 | -0.0081 | 0.203 |
| 291.843  | 0.000 | 2.361 | 5.612  | 1994.77 | 0.0052  | 0.202 |
| 580.082  | 0.000 | 2.454 | 7.063  | 3150.98 | 0.0007  | 0.201 |
| 1162.325 | 0.000 | 2.520 | 8.963  | 5064.27 | -0.0027 | 0.201 |
| 2196.100 | 0.000 | 2.522 | 11.737 | 8671.64 | -0.0027 | 0.200 |
| 2207.010 | 0.000 | 2.464 | 11.773 | 8725.00 | 0.0001  | 0.200 |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.3087 M ABOVE DISCHARGE PORT

AVG DILUTION = 309.2886 B = 2.16 M

MAXIMUM RISE (CENTER) = 3.0735 M ABOVE DISCHARGE PORT

AVG DILUTION = 466.2746 B = 2.68 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 8 JETLAG 2000  
TITLE Jet8

INPUT PARAMETERS

^^^^^^^^^^^^^^^^^^^^

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES

^^^^^^^^^^^^^^^^^^^^

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0100 (m3/s) | Qj    | ... 1.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 3.54E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 2.83E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 3.5368 (m/s)  | lm    | ... 0.9403 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.3534 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 1.5337 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 17.6839          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 2.4984           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0565           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0347           |
| Fd       | ... 27.15         | lm/lb | ... 2.6605           |
| Uj/Ua    | ... 17.68         | lM/lb | ... 4.3395           |

Coflowing case:

dMj ... 0.0334  
lm\* ... 0.9133  
Sm\* ... 16.6839

Stratification case:

T ... -4784.49

| X      | Y     | Z     | PLUME RADIUS | AVERAGE DILUTION | DENSITY DIFF. (sigmat) | VELOCITY |
|--------|-------|-------|--------------|------------------|------------------------|----------|
| (m)    | (m)   | (m)   | (m)          |                  |                        | (m/s)    |
| 0.000  | 0.000 | 0.000 | 0.030        | 1.00             | 29.6379                | 3.537    |
| -0.173 | 0.000 | 0.000 | 0.061        | 1.95             | 7.5047                 | 1.688    |
| -0.522 | 0.000 | 0.004 | 0.128        | 3.85             | 3.7839                 | 0.749    |

|                                |       |       |       |         |         |       |
|--------------------------------|-------|-------|-------|---------|---------|-------|
| -1.180                         | 0.000 | 0.043 | 0.278 | 7.31    | 1.9907  | 0.301 |
| -2.100                         | 0.000 | 0.337 | 0.517 | 11.61   | 1.2402  | 0.138 |
| -2.280                         | 0.000 | 0.563 | 0.839 | 17.13   | 0.8317  | 0.077 |
| -2.139                         | 0.000 | 0.744 | 0.999 | 31.46   | 0.4458  | 0.100 |
| -1.149                         | 0.000 | 1.146 | 1.153 | 61.95   | 0.2117  | 0.148 |
| 1.259                          | 0.000 | 1.755 | 1.502 | 123.73  | 0.0839  | 0.174 |
| 6.365                          | 0.000 | 2.626 | 2.050 | 247.02  | 0.0104  | 0.187 |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |       |         |         |       |
| 21.498                         | 0.000 | 3.643 | 2.719 | 445.49  | -0.0328 | 0.192 |
| MAXIMUM RISE REACHED           |       |       |       |         |         |       |
| TRAPPING LEVEL REACHED         |       |       |       |         |         |       |
| 58.538                         | 0.000 | 2.782 | 3.493 | 748.65  | 0.0108  | 0.195 |
| 130.483                        | 0.000 | 3.218 | 4.523 | 1266.79 | -0.0102 | 0.197 |
| 275.557                        | 0.000 | 2.875 | 5.692 | 2017.64 | 0.0069  | 0.198 |
| 563.189                        | 0.000 | 2.937 | 7.157 | 3200.32 | 0.0038  | 0.199 |
| 1148.433                       | 0.000 | 3.035 | 9.046 | 5123.67 | -0.0010 | 0.199 |
| 1156.797                       | 0.000 | 2.986 | 9.078 | 5159.35 | 0.0014  | 0.199 |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.8238 M ABOVE DISCHARGE PORT

AVG DILUTION = 280.8942 B = 2.18 M

MAXIMUM RISE (CENTER) = 3.6436 M ABOVE DISCHARGE PORT

AVG DILUTION = 445.5409 B = 2.72 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 9 JETLAG 2000  
TITLE Jet9

INPUT PARAMETERS

^^^^^^^^^^^^^^^^^^^^

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES

^^^^^^^^^^^^^^^^^^^^

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0100 (m3/s) | Qj    | ... 1.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 3.54E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 2.83E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 3.5368 (m/s)  | lm    | ... 0.9403 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.3534 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 1.5337 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 17.6839          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 2.4984           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0565           |
| Hor. ang | ... 0.00          | lQ/lM | ... 0.0347           |
| Fd       | ... 27.15         | lm/lb | ... 2.6605           |
| Uj/Ua    | ... 17.68         | lM/lb | ... 4.3395           |

Coflowing case:

dMj ... 0.0334  
lm\* ... 0.9133  
Sm\* ... 16.6839

Stratification case:

T ... -4784.49

| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 3.537             |
| 0.183                          | 0.000    | 0.000    | 0.057                  | 1.95                | 7.5019                       | 1.886             |
| 0.554                          | 0.000    | 0.003    | 0.108                  | 3.86                | 3.7754                       | 1.045             |
| 1.300                          | 0.000    | 0.022    | 0.198                  | 7.67                | 1.8968                       | 0.624             |
| 2.758                          | 0.000    | 0.119    | 0.343                  | 15.29               | 0.9476                       | 0.414             |
| 4.629                          | 0.000    | 0.347    | 0.561                  | 30.54               | 0.4660                       | 0.309             |
| 6.981                          | 0.000    | 0.709    | 0.871                  | 61.03               | 0.2201                       | 0.256             |
| 10.298                         | 0.000    | 1.226    | 1.302                  | 121.94              | 0.0915                       | 0.229             |
| 15.879                         | 0.000    | 1.972    | 1.900                  | 243.53              | 0.0188                       | 0.215             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| 30.730                         | 0.000    | 3.035    | 2.652                  | 457.74              | -0.0300                      | 0.207             |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 69.974                         | 0.000    | 2.139    | 3.375                  | 731.72              | 0.0159                       | 0.204             |
| 144.774                        | 0.000    | 2.625    | 4.432                  | 1250.61             | -0.0081                      | 0.203             |
| 291.843                        | 0.000    | 2.361    | 5.612                  | 1994.77             | 0.0052                       | 0.202             |
| 580.082                        | 0.000    | 2.454    | 7.063                  | 3150.98             | 0.0007                       | 0.201             |
| 1162.325                       | 0.000    | 2.520    | 8.963                  | 5064.27             | -0.0027                      | 0.201             |
| 2196.100                       | 0.000    | 2.522    | 11.737                 | 8671.64             | -0.0027                      | 0.200             |
| 2207.010                       | 0.000    | 2.464    | 11.773                 | 8725.00             | 0.0001                       | 0.200             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.3087 M ABOVE DISCHARGE PORT

AVG DILUTION = 309.2886 B = 2.16 M

MAXIMUM RISE (CENTER) = 3.0735 M ABOVE DISCHARGE PORT

AVG DILUTION = 466.2746 B = 2.68 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 10 JETLAG 2000

TITLE Jet10

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 3.537  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.83E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 0.9403 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.3534 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 1.5337 (m)       |
| po       | ... | 0.99827(g/cc) | sm    | ... | 17.6839          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 2.4984           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0565           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0347           |

Fd ... 27.15  
Uj/Ua ... 17.68

lm/lb ... 2.6605  
lm/lb ... 4.3395

Coflowing case:  
dmj ... 0.0334  
lm\* ... 0.9133  
Sm\* ... 16.6839

Stratification case:  
T ... -4784.49

| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 3.537             |
| -0.173                         | 0.000    | 0.000    | 0.061                  | 1.95                | 7.5047                       | 1.688             |
| -0.522                         | 0.000    | 0.004    | 0.128                  | 3.85                | 3.7839                       | 0.749             |
| -1.180                         | 0.000    | 0.043    | 0.278                  | 7.31                | 1.9907                       | 0.301             |
| -2.100                         | 0.000    | 0.337    | 0.517                  | 11.61               | 1.2402                       | 0.138             |
| -2.280                         | 0.000    | 0.563    | 0.839                  | 17.13               | 0.8317                       | 0.077             |
| -2.139                         | 0.000    | 0.744    | 0.999                  | 31.46               | 0.4458                       | 0.100             |
| -1.149                         | 0.000    | 1.146    | 1.153                  | 61.95               | 0.2117                       | 0.148             |
| 1.259                          | 0.000    | 1.755    | 1.502                  | 123.73              | 0.0839                       | 0.174             |
| 6.365                          | 0.000    | 2.626    | 2.050                  | 247.02              | 0.0104                       | 0.187             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| 21.498                         | 0.000    | 3.643    | 2.719                  | 445.49              | -0.0328                      | 0.192             |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 58.538                         | 0.000    | 2.782    | 3.493                  | 748.65              | 0.0108                       | 0.195             |
| 130.483                        | 0.000    | 3.218    | 4.523                  | 1266.79             | -0.0102                      | 0.197             |
| 275.557                        | 0.000    | 2.875    | 5.692                  | 2017.64             | 0.0069                       | 0.198             |
| 563.189                        | 0.000    | 2.937    | 7.157                  | 3200.32             | 0.0038                       | 0.199             |
| 1148.433                       | 0.000    | 3.035    | 9.046                  | 5123.67             | -0.0010                      | 0.199             |
| 1156.797                       | 0.000    | 2.986    | 9.078                  | 5159.35             | 0.0014                       | 0.199             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.8238 M ABOVE DISCHARGE PORT

AVG DILUTION = 280.8942 B = 2.18 M

MAXIMUM RISE (CENTER) = 3.6436 M ABOVE DISCHARGE PORT

AVG DILUTION = 445.5409 B = 2.72 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

### **SIMULACIÓN 11**

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 1

JETLAG 2000

TITLE Jet1

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC

SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 4.24E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 1.4105 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.5302 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 2.3006 (m)       |
| po       | ... | 0.99827(g/cc) | sm    | ... | 26.5258          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 3.7476           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0377           |
| Hor. ang | ... | 90.00         | lQ/lM | ... | 0.0231           |
| Fd       | ... | 40.73         | lm/lb | ... | 2.6605           |
| Uj/Ua    | ... | 26.53         | lM/lb | ... | 4.3395           |

Stratification case:  
 T ... -4784.49

| X                              | Y      | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|--------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)    | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000  | 0.000 | 0.030           | 1.00                | 29.6379                      | 5.305             |
| 0.003                          | 0.183  | 0.000 | 0.059           | 1.94                | 7.5435                       | 2.697             |
| 0.028                          | 0.522  | 0.001 | 0.116           | 3.84                | 3.7948                       | 1.359             |
| 0.113                          | 1.001  | 0.007 | 0.228           | 7.64                | 1.9049                       | 0.699             |
| 0.320                          | 1.533  | 0.025 | 0.433           | 15.24               | 0.9541                       | 0.387             |
| 0.736                          | 2.048  | 0.065 | 0.750           | 30.42               | 0.4763                       | 0.258             |
| 1.603                          | 2.563  | 0.148 | 1.160           | 60.65               | 0.2358                       | 0.215             |
| 3.991                          | 3.263  | 0.405 | 1.681           | 120.86              | 0.1087                       | 0.204             |
| 9.732                          | 4.113  | 1.093 | 2.389           | 241.18              | 0.0291                       | 0.202             |
| NEUTRAL BUOYANCY LEVEL REACHED |        |       |                 |                     |                              |                   |
| 23.620                         | 5.122  | 2.219 | 3.378           | 478.08              | -0.0258                      | 0.200             |
| MAXIMUM RISE REACHED           |        |       |                 |                     |                              |                   |
| TRAPPING LEVEL REACHED         |        |       |                 |                     |                              |                   |
| 64.699                         | 6.694  | 1.534 | 4.631           | 897.81              | 0.0120                       | 0.200             |
| 161.496                        | 8.664  | 1.757 | 6.313           | 1669.11             | 0.0019                       | 0.200             |
| 392.466                        | 11.246 | 1.797 | 8.477           | 3009.61             | -0.0003                      | 0.200             |
| 952.943                        | 14.711 | 1.737 | 11.407          | 5449.80             | 0.0026                       | 0.200             |
| 2029.920                       | 18.490 | 1.777 | 15.383          | 9911.52             | 0.0005                       | 0.200             |
| 3117.221                       | 20.667 | 1.859 | 20.193          | 17079.61            | -0.0035                      | 0.200             |
| 3128.196                       | 20.683 | 1.751 | 20.261          | 17195.28            | 0.0018                       | 0.200             |

NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 1.5930 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 332.5764 B = 2.81 M  
 MAXIMUM RISE (CENTER) = 2.3123 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 531.8036 B = 3.56 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 CASE NO. 2 JETLAG 2000

TITLE Jet2

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 4.24E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 1.4105 (m)       |
| ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.5302 (m)       |
| dp/pa    | ... | 0.02883       | lm    | ... | 2.3006 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 26.5258          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 3.7476           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0377           |
| Hor. ang | ... | 180.00        | lQ/lm | ... | 0.0231           |
| Fd       | ... | 40.73         | lm/lb | ... | 2.6605           |
| Uj/ua    | ... | 26.53         | lm/lb | ... | 4.3395           |

Stratification case:

T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 5.305             |
| -0.175                         | 0.000 | 0.000 | 0.060           | 1.95                | 7.5042                       | 2.582             |
| -0.527                         | 0.000 | 0.002 | 0.124           | 3.86                | 3.7789                       | 1.196             |
| -1.223                         | 0.000 | 0.018 | 0.267           | 7.60                | 1.9160                       | 0.507             |
| -2.508                         | 0.000 | 0.196 | 0.535           | 13.07               | 1.1056                       | 0.218             |
| -3.395                         | 0.000 | 0.677 | 0.970           | 20.33               | 0.6918                       | 0.103             |
| -3.458                         | 0.000 | 0.940 | 1.457           | 33.07               | 0.4155                       | 0.074             |
| -2.848                         | 0.000 | 1.322 | 1.545           | 61.69               | 0.2082                       | 0.123             |
| -0.515                         | 0.000 | 2.053 | 1.909           | 123.21              | 0.0778                       | 0.161             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| 4.950                          | 0.000 | 3.092 | 2.553           | 245.92              | 0.0012                       | 0.180             |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |                   |
| 23.645                         | 0.000 | 3.909 | 3.258           | 416.44              | -0.0288                      | 0.187             |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |                   |
| 62.896                         | 0.000 | 3.447 | 4.293           | 744.93              | -0.0069                      | 0.193             |
| 145.173                        | 0.000 | 3.307 | 5.418           | 1202.78             | 0.0015                       | 0.196             |
| 308.653                        | 0.000 | 3.433 | 6.795           | 1906.91             | -0.0051                      | 0.197             |
| 636.240                        | 0.000 | 3.352 | 8.578           | 3055.12             | -0.0012                      | 0.198             |
| 1317.183                       | 0.000 | 3.387 | 10.889          | 4939.84             | -0.0029                      | 0.199             |
| 1326.725                       | 0.000 | 3.341 | 10.918          | 4966.24             | -0.0006                      | 0.199             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.1159 M ABOVE DISCHARGE PORT

AVG DILUTION = 249.2542 B = 2.57 M

MAXIMUM RISE (CENTER) = 4.0389 M ABOVE DISCHARGE PORT

AVG DILUTION = 395.2737 B = 3.18 M



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COMPUTATIONS CEASE:  NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)
1
ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT
.....
CASE NO.      3                                           JETLAG 2000
TITLE        Jet3

INPUT PARAMETERS
AAAAAAAAAAAAAAAA
ENTRAINMENT HYPOTHESIS : ASYMMETRIC
SHEAR ENTRAINMENT      : VARIABLE (0 - 0.085)
COFLOW FACTOR          : STANDARD
TIME STEP CONTRL       : VARIABLE ( > 0.985 )
MAX NUMBER OF TIME STEPS : 1500
PRINTOUT INTERVAL      : 100
MAX NUMBER OF ITERATIONS : 5
ITERATION ERROR BOUND   : 0.00100
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS
AAAAAAAAAAAAAAAA
      DEPTH(m)      S      T(C)      SIGMAT      U(m/s)
EXIT      29.30      0.00      20.00      -1.73      5.305
.....
AMBIENT    0.00      37.00      25.00      24.88      0.200
           30.00      38.50      18.00      27.97      0.200

LENGTH & DILUTION SCALES
AAAAAAAAAAAAAAAA
Total Q ... 0.0150 (m3/s)      Qj ... 1.50E-02 (m3/s)
Port No. ... 1                Mj ... 7.96E-02 (m4/s2)
Depth ... 29.3000 (m)         Bj ... 4.24E-03 (m4/s3)
Diameter ... 0.0600 (m)       lQ ... 0.0532 (m)
Uj ... 5.3052 (m/s)           lm ... 1.4105 (m)
Ua ... 0.2000 (m/s)           lb ... 0.5302 (m)
dp/pa ... 0.02883            lM ... 2.3006 (m)
po ... 0.99827 (g/cc)         sm ... 26.5258
pa ... 1.02790 (g/cc)         Sb ... 3.7476
Ver. ang ... 0.00             lQ/lm ... 0.0377
Hor. ang ... 0.00             lQ/lM ... 0.0231
Fd ... 40.73                  lm/lb ... 2.6605
Uj/Ua ... 26.53               lM/lb ... 4.3395

Coflowing case:
dmj ... 0.0766
lm* ... 1.3836
sm* ... 25.5258

Stratification case:
T ... -4784.49

      X      Y      Z      PLUME      AVERAGE      DENSITY      VELOCITY
      (m)    (m)    (m)    RADIUS    DILUTION      DIFF.        (m/s)
      .....
      0.000    0.000    0.000    0.030    1.00    29.6379    5.305
      0.181    0.000    0.000    0.058    1.95    7.5024    2.779
      0.548    0.000    0.001    0.111    3.86    3.7761    1.494
      1.283    0.000    0.011    0.208    7.67    1.8978    0.849
      2.764    0.000    0.066    0.372    15.27    0.9506    0.526
      5.311    0.000    0.289    0.631    30.48    0.4678    0.365
      8.402    0.000    0.709    1.011    60.91    0.2188    0.285
      12.519   0.000    1.339    1.545    121.72   0.0868    0.243
      19.177   0.000    2.242    2.287    243.08   0.0107    0.222
NEUTRAL BUOYANCY LEVEL REACHED
MAXIMUM RISE REACHED
38.024    0.000    3.290    3.114    429.76   -0.0335    0.212
TRAPPING LEVEL REACHED
84.045    0.000    2.703    4.150    746.15   -0.0045    0.207
173.522   0.000    2.579    5.325    1212.25   0.0031    0.204
346.720   0.000    2.663    6.736    1925.30  -0.0013    0.203
685.830   0.000    2.727    8.527    3070.36  -0.0045    0.202

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|          |       |       |        |         |         |       |
|----------|-------|-------|--------|---------|---------|-------|
| 1379.682 | 0.000 | 2.628 | 10.856 | 4961.41 | 0.0003  | 0.201 |
| 2452.842 | 0.000 | 2.706 | 14.306 | 8597.62 | -0.0035 | 0.201 |
| 2463.601 | 0.000 | 2.699 | 14.335 | 8632.45 | -0.0031 | 0.201 |

NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 2.4464 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 275.1171 B = 2.45 M  
 MAXIMUM RISE (CENTER) = 3.2994 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 426.4832 B = 3.10 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 4 JETLAG 2000  
 TITLE Jet4

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^^^^^  

|      |          |      |       |        |        |
|------|----------|------|-------|--------|--------|
| EXIT | DEPTH(m) | S    | T(C)  | SIGMAT | U(m/s) |
|      | 29.30    | 0.00 | 20.00 | -1.73  | 5.305  |

|         |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|
| AMBIENT | 0.00  | 37.00 | 25.00 | 24.88 | 0.200 |
|         | 30.00 | 38.50 | 18.00 | 27.97 | 0.200 |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^^^^^  

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 4.24E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| uj       | ... | 5.3052 (m/s)  | lm    | ... | 1.4105 (m)       |
| ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.5302 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 2.3006 (m)       |
| po       | ... | 0.99827(g/cc) | sm    | ... | 26.5258          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 3.7476           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0377           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0231           |
| Fd       | ... | 40.73         | lm/lb | ... | 2.6605           |
| uj/ua    | ... | 26.53         | lM/lb | ... | 4.3395           |

Coflowing case:  
 dmj ... 0.0766  
 lm\* ... 1.3836  
 sm\* ... 25.5258

Stratification case:  
 T ... -4784.49

| X      | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)    | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000  | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 5.305    |
| -0.175 | 0.000 | 0.000 | 0.060           | 1.95                | 7.5042                       | 2.582    |
| -0.527 | 0.000 | 0.002 | 0.124           | 3.86                | 3.7789                       | 1.196    |
| -1.223 | 0.000 | 0.018 | 0.267           | 7.60                | 1.9160                       | 0.507    |
| -2.508 | 0.000 | 0.196 | 0.535           | 13.07               | 1.1056                       | 0.218    |
| -3.395 | 0.000 | 0.677 | 0.970           | 20.33               | 0.6918                       | 0.103    |
| -3.458 | 0.000 | 0.940 | 1.457           | 33.07               | 0.4155                       | 0.074    |

|                                |       |       |        |         |         |       |
|--------------------------------|-------|-------|--------|---------|---------|-------|
| -2.848                         | 0.000 | 1.322 | 1.545  | 61.69   | 0.2082  | 0.123 |
| -0.515                         | 0.000 | 2.053 | 1.909  | 123.21  | 0.0778  | 0.161 |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |        |         |         |       |
| 4.950                          | 0.000 | 3.092 | 2.553  | 245.92  | 0.0012  | 0.180 |
| MAXIMUM RISE REACHED           |       |       |        |         |         |       |
| 23.645                         | 0.000 | 3.909 | 3.258  | 416.44  | -0.0288 | 0.187 |
| TRAPPING LEVEL REACHED         |       |       |        |         |         |       |
| 62.896                         | 0.000 | 3.447 | 4.293  | 744.93  | -0.0069 | 0.193 |
| 145.173                        | 0.000 | 3.307 | 5.418  | 1202.78 | 0.0015  | 0.196 |
| 308.653                        | 0.000 | 3.433 | 6.795  | 1906.91 | -0.0051 | 0.197 |
| 636.240                        | 0.000 | 3.352 | 8.578  | 3055.12 | -0.0012 | 0.198 |
| 1317.183                       | 0.000 | 3.387 | 10.889 | 4939.84 | -0.0029 | 0.199 |
| 1326.725                       | 0.000 | 3.341 | 10.918 | 4966.24 | -0.0006 | 0.199 |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.1159 M ABOVE DISCHARGE PORT

AVG DILUTION = 249.2542 B = 2.57 M

MAXIMUM RISE (CENTER) = 4.0389 M ABOVE DISCHARGE PORT

AVG DILUTION = 395.2737 B = 3.18 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 5 JETLAG 2000

TITLE Jet5

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                          |                        |
|--------------------------|------------------------|
| ENTRAINMENT HYPOTHESIS   | : ASYMMETRIC           |
| SHEAR ENTRAINMENT        | : VARIABLE (0 - 0.085) |
| COFLOW FACTOR            | : STANDARD             |
| TIME STEP CONTRL         | : VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS | : 1500                 |

|                            |           |
|----------------------------|-----------|
| PRINTOUT INTERVAL          | : 100     |
| MAX NUMBER OF ITERATIONS   | : 5       |
| ITERATION ERROR BOUND      | : 0.00100 |
| APPROX RATIO OF MASS/DMASS | : 144.0   |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj    | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 4.24E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | lm    | ... 1.4105 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.5302 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 2.3006 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 26.5258          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 3.7476           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0377           |
| Hor. ang | ... 0.00          | lQ/lM | ... 0.0231           |
| Fd       | ... 40.73         | lm/lb | ... 2.6605           |
| Uj/Ua    | ... 26.53         | lM/lb | ... 4.3395           |

Coflowing case:

|     |             |
|-----|-------------|
| dMj | ... 0.0766  |
| lm* | ... 1.3836  |
| Sm* | ... 25.5258 |

Stratification case:

|   |              |
|---|--------------|
| T | ... -4784.49 |
|---|--------------|

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 5.305             |
| 0.181    | 0.000    | 0.000    | 0.058                  | 1.95                | 7.5024                       | 2.779             |
| 0.548    | 0.000    | 0.001    | 0.111                  | 3.86                | 3.7761                       | 1.494             |
| 1.283    | 0.000    | 0.011    | 0.208                  | 7.67                | 1.8978                       | 0.849             |
| 2.764    | 0.000    | 0.066    | 0.372                  | 15.27               | 0.9506                       | 0.526             |
| 5.311    | 0.000    | 0.289    | 0.631                  | 30.48               | 0.4678                       | 0.365             |
| 8.402    | 0.000    | 0.709    | 1.011                  | 60.91               | 0.2188                       | 0.285             |
| 12.519   | 0.000    | 1.339    | 1.545                  | 121.72              | 0.0868                       | 0.243             |
| 19.177   | 0.000    | 2.242    | 2.287                  | 243.08              | 0.0107                       | 0.222             |

NEUTRAL BUOYANCY LEVEL REACHED

MAXIMUM RISE REACHED

|        |       |       |       |        |         |       |
|--------|-------|-------|-------|--------|---------|-------|
| 38.024 | 0.000 | 3.290 | 3.114 | 429.76 | -0.0335 | 0.212 |
|--------|-------|-------|-------|--------|---------|-------|

TRAPPING LEVEL REACHED

|          |       |       |        |         |         |       |
|----------|-------|-------|--------|---------|---------|-------|
| 84.045   | 0.000 | 2.703 | 4.150  | 746.15  | -0.0045 | 0.207 |
| 173.522  | 0.000 | 2.579 | 5.325  | 1212.25 | 0.0031  | 0.204 |
| 346.720  | 0.000 | 2.663 | 6.736  | 1925.30 | -0.0013 | 0.203 |
| 685.830  | 0.000 | 2.727 | 8.527  | 3070.36 | -0.0045 | 0.202 |
| 1379.682 | 0.000 | 2.628 | 10.856 | 4961.41 | 0.0003  | 0.201 |
| 2452.842 | 0.000 | 2.706 | 14.306 | 8597.62 | -0.0035 | 0.201 |
| 2463.601 | 0.000 | 2.699 | 14.335 | 8632.45 | -0.0031 | 0.201 |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.4464 M ABOVE DISCHARGE PORT

AVG DILUTION = 275.1171 B = 2.45 M

MAXIMUM RISE (CENTER) = 3.2994 M ABOVE DISCHARGE PORT

AVG DILUTION = 426.4832 B = 3.10 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

|          |      |             |
|----------|------|-------------|
| CASE NO. | 6    | JETLAG 2000 |
| TITLE    | Jet6 |             |

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |                        |
|----------------------------|------------------------|
| ENTRAINMENT HYPOTHESIS     | : ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : STANDARD             |
| TIME STEP CONTRL           | : VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : 1500                 |
| PRINTOUT INTERVAL          | : 100                  |
| MAX NUMBER OF ITERATIONS   | : 5                    |
| ITERATION ERROR BOUND      | : 0.00100              |
| APPROX RATIO OF MASS/DMASS | : 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         |          |       |       |        |        |
|---------|----------|-------|-------|--------|--------|
|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj    | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 4.24E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | lm    | ... 1.4105 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.5302 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 2.3006 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 26.5258          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 3.7476           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0377           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0231           |
| Fd       | ... 40.73         | lm/lb | ... 2.6605           |
| Uj/Ua    | ... 26.53         | lM/lb | ... 4.3395           |

Coflowing case:  
 dmj ... 0.0766  
 lm\* ... 1.3836  
 Sm\* ... 25.5258

Stratification case:  
 T ... -4784.49

| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 5.305             |
| -0.175                         | 0.000    | 0.000    | 0.060                  | 1.95                | 7.5042                       | 2.582             |
| -0.527                         | 0.000    | 0.002    | 0.124                  | 3.86                | 3.7789                       | 1.196             |
| -1.223                         | 0.000    | 0.018    | 0.267                  | 7.60                | 1.9160                       | 0.507             |
| -2.508                         | 0.000    | 0.196    | 0.535                  | 13.07               | 1.1056                       | 0.218             |
| -3.395                         | 0.000    | 0.677    | 0.970                  | 20.33               | 0.6918                       | 0.103             |
| -3.458                         | 0.000    | 0.940    | 1.457                  | 33.07               | 0.4155                       | 0.074             |
| -2.848                         | 0.000    | 1.322    | 1.545                  | 61.69               | 0.2082                       | 0.123             |
| -0.515                         | 0.000    | 2.053    | 1.909                  | 123.21              | 0.0778                       | 0.161             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| 4.950                          | 0.000    | 3.092    | 2.553                  | 245.92              | 0.0012                       | 0.180             |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| 23.645                         | 0.000    | 3.909    | 3.258                  | 416.44              | -0.0288                      | 0.187             |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 62.896                         | 0.000    | 3.447    | 4.293                  | 744.93              | -0.0069                      | 0.193             |
| 145.173                        | 0.000    | 3.307    | 5.418                  | 1202.78             | 0.0015                       | 0.196             |
| 308.653                        | 0.000    | 3.433    | 6.795                  | 1906.91             | -0.0051                      | 0.197             |
| 636.240                        | 0.000    | 3.352    | 8.578                  | 3055.12             | -0.0012                      | 0.198             |
| 1317.183                       | 0.000    | 3.387    | 10.889                 | 4939.84             | -0.0029                      | 0.199             |
| 1326.725                       | 0.000    | 3.341    | 10.918                 | 4966.24             | -0.0006                      | 0.199             |

NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 3.1159 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 249.2542 B = 2.57 M  
 MAXIMUM RISE (CENTER) = 4.0389 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 395.2737 B = 3.18 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 CASE NO. 7 JETLAG 2000  
 TITLE Jet7

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^  
 Total Q ... 0.0150 (m3/s) Qj ... 1.50E-02 (m3/s)  
 Port No. ... 1 Mj ... 7.96E-02 (m4/s2)

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 4.24E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 1.4105 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.5302 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 2.3006 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 26.5258          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 3.7476           |
| ver. ang | ... | 0.00          | lQ/lm | ... | 0.0377           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0231           |
| Fd       | ... | 40.73         | lm/lb | ... | 2.6605           |
| Uj/Ua    | ... | 26.53         | lM/lb | ... | 4.3395           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0766  |
| lm* | ... | 1.3836  |
| Sm* | ... | 25.5258 |

Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 5.305    |
| 0.181                          | 0.000 | 0.000 | 0.058           | 1.95                | 7.5024                       | 2.779    |
| 0.548                          | 0.000 | 0.001 | 0.111           | 3.86                | 3.7761                       | 1.494    |
| 1.283                          | 0.000 | 0.011 | 0.208           | 7.67                | 1.8978                       | 0.849    |
| 2.764                          | 0.000 | 0.066 | 0.372           | 15.27               | 0.9506                       | 0.526    |
| 5.311                          | 0.000 | 0.289 | 0.631           | 30.48               | 0.4678                       | 0.365    |
| 8.402                          | 0.000 | 0.709 | 1.011           | 60.91               | 0.2188                       | 0.285    |
| 12.519                         | 0.000 | 1.339 | 1.545           | 121.72              | 0.0868                       | 0.243    |
| 19.177                         | 0.000 | 2.242 | 2.287           | 243.08              | 0.0107                       | 0.222    |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |          |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |          |
| 38.024                         | 0.000 | 3.290 | 3.114           | 429.76              | -0.0335                      | 0.212    |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |          |
| 84.045                         | 0.000 | 2.703 | 4.150           | 746.15              | -0.0045                      | 0.207    |
| 173.522                        | 0.000 | 2.579 | 5.325           | 1212.25             | 0.0031                       | 0.204    |
| 346.720                        | 0.000 | 2.663 | 6.736           | 1925.30             | -0.0013                      | 0.203    |
| 685.830                        | 0.000 | 2.727 | 8.527           | 3070.36             | -0.0045                      | 0.202    |
| 1379.682                       | 0.000 | 2.628 | 10.856          | 4961.41             | 0.0003                       | 0.201    |
| 2452.842                       | 0.000 | 2.706 | 14.306          | 8597.62             | -0.0035                      | 0.201    |
| 2463.601                       | 0.000 | 2.699 | 14.335          | 8632.45             | -0.0031                      | 0.201    |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.4464 M ABOVE DISCHARGE PORT

AVG DILUTION = 275.1171 B = 2.45 M

MAXIMUM RISE (CENTER) = 3.2994 M ABOVE DISCHARGE PORT

AVG DILUTION = 426.4832 B = 3.10 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

|          |      |             |
|----------|------|-------------|
| CASE NO. | 8    | JETLAG 2000 |
| TITLE    | Jet8 |             |

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |                        |
|----------------------------|------------------------|
| ENTRAINMENT HYPOTHESIS     | : ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : STANDARD             |
| TIME STEP CONTRL           | : VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : 1500                 |
| PRINTOUT INTERVAL          | : 100                  |
| MAX NUMBER OF ITERATIONS   | : 5                    |
| ITERATION ERROR BOUND      | : 0.00100              |
| APPROX RATIO OF MASS/DMASS | : 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

#### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 4.24E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 1.4105 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.5302 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 2.3006 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 26.5258          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 3.7476           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0377           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0231           |
| Fd       | ... | 40.73         | lm/lb | ... | 2.6605           |
| Uj/Ua    | ... | 26.53         | lM/lb | ... | 4.3395           |

#### Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0766  |
| lm* | ... | 1.3836  |
| Sm* | ... | 25.5258 |

#### Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

| X                              | Y     | Z     | PLUME RADIUS | AVERAGE DILUTION | DENSITY DIFF. (sigmat) | VELOCITY (m/s) |
|--------------------------------|-------|-------|--------------|------------------|------------------------|----------------|
| (m)                            | (m)   | (m)   | (m)          |                  |                        |                |
| 0.000                          | 0.000 | 0.000 | 0.030        | 1.00             | 29.6379                | 5.305          |
| -0.175                         | 0.000 | 0.000 | 0.060        | 1.95             | 7.5042                 | 2.582          |
| -0.527                         | 0.000 | 0.002 | 0.124        | 3.86             | 3.7789                 | 1.196          |
| -1.223                         | 0.000 | 0.018 | 0.267        | 7.60             | 1.9160                 | 0.507          |
| -2.508                         | 0.000 | 0.196 | 0.535        | 13.07            | 1.1056                 | 0.218          |
| -3.395                         | 0.000 | 0.677 | 0.970        | 20.33            | 0.6918                 | 0.103          |
| -3.458                         | 0.000 | 0.940 | 1.457        | 33.07            | 0.4155                 | 0.074          |
| -2.848                         | 0.000 | 1.322 | 1.545        | 61.69            | 0.2082                 | 0.123          |
| -0.515                         | 0.000 | 2.053 | 1.909        | 123.21           | 0.0778                 | 0.161          |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |              |                  |                        |                |
| 4.950                          | 0.000 | 3.092 | 2.553        | 245.92           | 0.0012                 | 0.180          |
| MAXIMUM RISE REACHED           |       |       |              |                  |                        |                |
| 23.645                         | 0.000 | 3.909 | 3.258        | 416.44           | -0.0288                | 0.187          |
| TRAPPING LEVEL REACHED         |       |       |              |                  |                        |                |
| 62.896                         | 0.000 | 3.447 | 4.293        | 744.93           | -0.0069                | 0.193          |
| 145.173                        | 0.000 | 3.307 | 5.418        | 1202.78          | 0.0015                 | 0.196          |
| 308.653                        | 0.000 | 3.433 | 6.795        | 1906.91          | -0.0051                | 0.197          |
| 636.240                        | 0.000 | 3.352 | 8.578        | 3055.12          | -0.0012                | 0.198          |
| 1317.183                       | 0.000 | 3.387 | 10.889       | 4939.84          | -0.0029                | 0.199          |
| 1326.725                       | 0.000 | 3.341 | 10.918       | 4966.24          | -0.0006                | 0.199          |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.1159 M ABOVE DISCHARGE PORT

AVG DILUTION = 249.2542 B = 2.57 M

MAXIMUM RISE (CENTER) = 4.0389 M ABOVE DISCHARGE PORT

AVG DILUTION = 395.2737 B = 3.18 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

..... JETLAG 2000

CASE NO. 9

TITLE Jet9

#### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                        |   |                      |
|------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT      | : | VARIABLE (0 - 0.085) |

COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

#### ENVIROMENTAL CONDITIONS

^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

#### LENGTH & DILUTION SCALES

^^  

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj    | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 4.24E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | lm    | ... 1.4105 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.5302 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 2.3006 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 26.5258          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 3.7476           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0377           |
| Hor. ang | ... 0.00          | lQ/lM | ... 0.0231           |
| Fd       | ... 40.73         | lm/lb | ... 2.6605           |
| Uj/Ua    | ... 26.53         | lM/lb | ... 4.3395           |

#### Coflowing case:

dMj ... 0.0766  
 lm\* ... 1.3836  
 Sm\* ... 25.5258

#### Stratification case:

T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 5.305             |
| 0.181                          | 0.000 | 0.000 | 0.058           | 1.95                | 7.5024                       | 2.779             |
| 0.548                          | 0.000 | 0.001 | 0.111           | 3.86                | 3.7761                       | 1.494             |
| 1.283                          | 0.000 | 0.011 | 0.208           | 7.67                | 1.8978                       | 0.849             |
| 2.764                          | 0.000 | 0.066 | 0.372           | 15.27               | 0.9506                       | 0.526             |
| 5.311                          | 0.000 | 0.289 | 0.631           | 30.48               | 0.4678                       | 0.365             |
| 8.402                          | 0.000 | 0.709 | 1.011           | 60.91               | 0.2188                       | 0.285             |
| 12.519                         | 0.000 | 1.339 | 1.545           | 121.72              | 0.0868                       | 0.243             |
| 19.177                         | 0.000 | 2.242 | 2.287           | 243.08              | 0.0107                       | 0.222             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |                   |
| 38.024                         | 0.000 | 3.290 | 3.114           | 429.76              | -0.0335                      | 0.212             |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |                   |
| 84.045                         | 0.000 | 2.703 | 4.150           | 746.15              | -0.0045                      | 0.207             |
| 173.522                        | 0.000 | 2.579 | 5.325           | 1212.25             | 0.0031                       | 0.204             |
| 346.720                        | 0.000 | 2.663 | 6.736           | 1925.30             | -0.0013                      | 0.203             |
| 685.830                        | 0.000 | 2.727 | 8.527           | 3070.36             | -0.0045                      | 0.202             |
| 1379.682                       | 0.000 | 2.628 | 10.856          | 4961.41             | 0.0003                       | 0.201             |
| 2452.842                       | 0.000 | 2.706 | 14.306          | 8597.62             | -0.0035                      | 0.201             |
| 2463.601                       | 0.000 | 2.699 | 14.335          | 8632.45             | -0.0031                      | 0.201             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.4464 M ABOVE DISCHARGE PORT

AVG DILUTION = 275.1171 B = 2.45 M

MAXIMUM RISE (CENTER) = 3.2994 M ABOVE DISCHARGE PORT

AVG DILUTION = 426.4832 B = 3.10 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)



1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 10 JETLAG 2000  
TITLE Jet10

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 5.305  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 4.24E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 1.4105 (m)       |
| ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.5302 (m)       |
| dp/pa    | ... | 0.02883       | lm    | ... | 2.3006 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 26.5258          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 3.7476           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0377           |
| Hor. ang | ... | 180.00        | lQ/lm | ... | 0.0231           |
| Fd       | ... | 40.73         | lm/lb | ... | 2.6605           |
| Uj/ua    | ... | 26.53         | lm/lb | ... | 4.3395           |

Coflowing case:

dMj ... 0.0766  
lm\* ... 1.3836  
Sm\* ... 25.5258

Stratification case:

T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 5.305             |
| -0.175                         | 0.000 | 0.000 | 0.060           | 1.95                | 7.5042                       | 2.582             |
| -0.527                         | 0.000 | 0.002 | 0.124           | 3.86                | 3.7789                       | 1.196             |
| -1.223                         | 0.000 | 0.018 | 0.267           | 7.60                | 1.9160                       | 0.507             |
| -2.508                         | 0.000 | 0.196 | 0.535           | 13.07               | 1.1056                       | 0.218             |
| -3.395                         | 0.000 | 0.677 | 0.970           | 20.33               | 0.6918                       | 0.103             |
| -3.458                         | 0.000 | 0.940 | 1.457           | 33.07               | 0.4155                       | 0.074             |
| -2.848                         | 0.000 | 1.322 | 1.545           | 61.69               | 0.2082                       | 0.123             |
| -0.515                         | 0.000 | 2.053 | 1.909           | 123.21              | 0.0778                       | 0.161             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| 4.950                          | 0.000 | 3.092 | 2.553           | 245.92              | 0.0012                       | 0.180             |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |                   |
| 23.645                         | 0.000 | 3.909 | 3.258           | 416.44              | -0.0288                      | 0.187             |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |                   |
| 62.896                         | 0.000 | 3.447 | 4.293           | 744.93              | -0.0069                      | 0.193             |
| 145.173                        | 0.000 | 3.307 | 5.418           | 1202.78             | 0.0015                       | 0.196             |
| 308.653                        | 0.000 | 3.433 | 6.795           | 1906.91             | -0.0051                      | 0.197             |

|          |       |       |        |         |         |       |
|----------|-------|-------|--------|---------|---------|-------|
| 636.240  | 0.000 | 3.352 | 8.578  | 3055.12 | -0.0012 | 0.198 |
| 1317.183 | 0.000 | 3.387 | 10.889 | 4939.84 | -0.0029 | 0.199 |
| 1326.725 | 0.000 | 3.341 | 10.918 | 4966.24 | -0.0006 | 0.199 |

NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 3.1159 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 249.2542 B = 2.57 M  
 MAXIMUM RISE (CENTER) = 4.0389 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 395.2737 B = 3.18 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

## SIMULACIÓN 12

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 1 JETLAG 2000  
 TITLE Jet1

### INPUT PARAMETERS ^^^^^^^^^^^^^^^^^^^^^

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

### ENVIROMENTAL CONDITIONS ^^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

### LENGTH & DILUTION SCALES ^^^^^^^^^^^^^^^^^^^^^

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0200 (m3/s) | Qj    | ... 2.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 1.41E-01 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 5.66E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 7.0736 (m/s)  | lm    | ... 1.8806 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.7069 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 3.0675 (m)       |
| po       | ... 0.99827(g/cc) | sm    | ... 35.3678          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 4.9968           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0283           |
| Hor. ang | ... 90.00         | lQ/lM | ... 0.0173           |
| Fd       | ... 54.31         | lm/lb | ... 2.6605           |
| Uj/Ua    | ... 35.37         | lM/lb | ... 4.3395           |

Stratification case:  
 T ... -4784.49

| X     | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|-------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)   | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000 | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 7.074    |
| 0.002 | 0.179 | 0.000 | 0.059           | 1.94                | 7.5311                       | 3.588    |
| 0.022 | 0.543 | 0.001 | 0.116           | 3.84                | 3.7960                       | 1.808    |
| 0.099 | 1.112 | 0.005 | 0.230           | 7.64                | 1.9064                       | 0.920    |
| 0.302 | 1.808 | 0.022 | 0.445           | 15.23               | 0.9550                       | 0.490    |
| 0.734 | 2.516 | 0.061 | 0.805           | 30.39               | 0.4768                       | 0.298    |
| 1.556 | 3.176 | 0.139 | 1.302           | 60.65               | 0.2360                       | 0.228    |
| 3.654 | 3.994 | 0.350 | 1.926           | 120.85              | 0.1105                       | 0.207    |

|                                |        |       |        |          |         |       |
|--------------------------------|--------|-------|--------|----------|---------|-------|
| 9.168                          | 5.077  | 0.971 | 2.753  | 241.02   | 0.0323  | 0.202 |
| NEUTRAL BUOYANCY LEVEL REACHED |        |       |        |          |         |       |
| 22.978                         | 6.418  | 2.106 | 3.905  | 479.76   | -0.0244 | 0.200 |
| MAXIMUM RISE REACHED           |        |       |        |          |         |       |
| TRAPPING LEVEL REACHED         |        |       |        |          |         |       |
| 64.720                         | 8.499  | 1.465 | 5.436  | 928.15   | 0.0116  | 0.200 |
| 168.150                        | 11.178 | 1.582 | 7.503  | 1768.11  | 0.0066  | 0.200 |
| 427.623                        | 14.769 | 1.758 | 10.228 | 3285.63  | -0.0022 | 0.200 |
| 1086.123                       | 19.657 | 1.680 | 13.968 | 6128.65  | 0.0016  | 0.200 |
| 2210.056                       | 24.356 | 1.802 | 18.879 | 11196.26 | -0.0043 | 0.200 |
| 3296.665                       | 26.923 | 1.742 | 24.849 | 19399.48 | -0.0013 | 0.200 |
| 3307.281                       | 26.941 | 1.841 | 24.919 | 19506.50 | -0.0062 | 0.200 |

NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 1.5174 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 342.2617 B = 3.29 M  
 MAXIMUM RISE (CENTER) = 2.2209 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 547.7349 B = 4.18 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 2 JETLAG 2000  
 TITLE Jet2

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^  

|         |          |       |       |        |        |
|---------|----------|-------|-------|--------|--------|
|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^  

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0200 (m3/s) | Qj    | ... 2.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 1.41E-01 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 5.66E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 7.0736 (m/s)  | lm    | ... 1.8806 (m)       |
| ua       | ... 0.2000 (m/s)  | lb    | ... 0.7069 (m)       |
| dp/pa    | ... 0.02883       | lm    | ... 3.0675 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 35.3678          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 4.9968           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0283           |
| Hor. ang | ... 180.00        | lQ/lm | ... 0.0173           |
| Fd       | ... 54.31         | lm/lb | ... 2.6605           |
| Uj/ua    | ... 35.37         | lm/lb | ... 4.3395           |

Stratification case:  
 T ... -4784.49

| X      | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)    | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000  | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 7.074             |
| -0.175 | 0.000 | 0.000 | 0.060           | 1.95                | 7.5040                       | 3.475             |
| -0.529 | 0.000 | 0.001 | 0.122           | 3.86                | 3.7785                       | 1.644             |

|                                |       |       |        |         |         |       |
|--------------------------------|-------|-------|--------|---------|---------|-------|
| -1.236                         | 0.000 | 0.009 | 0.259  | 7.65    | 1.9031  | 0.727 |
| -2.564                         | 0.000 | 0.097 | 0.559  | 14.42   | 1.0055  | 0.293 |
| -4.346                         | 0.000 | 0.694 | 1.038  | 22.90   | 0.6089  | 0.135 |
| -4.676                         | 0.000 | 1.137 | 1.683  | 33.86   | 0.3941  | 0.076 |
| -4.367                         | 0.000 | 1.499 | 1.979  | 62.61   | 0.1994  | 0.102 |
| -2.271                         | 0.000 | 2.292 | 2.300  | 123.38  | 0.0720  | 0.149 |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |        |         |         |       |
| 3.406                          | 0.000 | 3.466 | 3.008  | 246.20  | -0.0066 | 0.173 |
| MAXIMUM RISE REACHED           |       |       |        |         |         |       |
| 24.088                         | 0.000 | 3.949 | 3.804  | 417.17  | -0.0174 | 0.184 |
| TRAPPING LEVEL REACHED         |       |       |        |         |         |       |
| 65.868                         | 0.000 | 3.924 | 4.940  | 729.75  | -0.0185 | 0.190 |
| 155.175                        | 0.000 | 3.310 | 6.167  | 1158.53 | 0.0122  | 0.194 |
| 334.327                        | 0.000 | 3.506 | 7.765  | 1858.27 | 0.0024  | 0.196 |
| 694.819                        | 0.000 | 3.649 | 9.793  | 2977.26 | -0.0045 | 0.198 |
| 1453.027                       | 0.000 | 3.504 | 12.472 | 4851.61 | 0.0026  | 0.199 |
| 1464.459                       | 0.000 | 3.491 | 12.503 | 4875.27 | 0.0032  | 0.199 |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.3273 M ABOVE DISCHARGE PORT

AVG DILUTION = 229.4070 B = 2.92 M

MAXIMUM RISE (CENTER) = 4.3286 M ABOVE DISCHARGE PORT

AVG DILUTION = 364.2120 B = 3.58 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 3 JETLAG 2000  
TITLE Jet3

INPUT PARAMETERS

^^^^^^^^^^^^^^^^^^^^

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES

^^^^^^^^^^^^^^^^^^^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.66E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.7069 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 3.0675 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 4.9968           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0173           |
| Fd       | ... | 54.31         | lm/lb | ... | 2.6605           |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 4.3395           |

Coflowing case:

dMj ... 0.1375  
lm\* ... 1.8539  
Sm\* ... 34.3678

Stratification case:

T ... -4784.49

| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 7.074             |
| 0.180                          | 0.000    | 0.000    | 0.058                  | 1.95                | 7.5026                       | 3.672             |
| 0.545                          | 0.000    | 0.001    | 0.112                  | 3.86                | 3.7764                       | 1.942             |
| 1.275                          | 0.000    | 0.006    | 0.213                  | 7.67                | 1.8983                       | 1.074             |
| 2.742                          | 0.000    | 0.041    | 0.390                  | 15.26               | 0.9518                       | 0.639             |
| 5.640                          | 0.000    | 0.227    | 0.678                  | 30.44               | 0.4701                       | 0.421             |
| 9.444                          | 0.000    | 0.672    | 1.113                  | 60.83               | 0.2190                       | 0.313             |
| 14.335                         | 0.000    | 1.387    | 1.733                  | 121.56              | 0.0837                       | 0.258             |
| 22.014                         | 0.000    | 2.419    | 2.598                  | 242.74              | 0.0045                       | 0.229             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| 44.235                         | 0.000    | 3.315    | 3.519                  | 420.30              | -0.0295                      | 0.216             |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 96.046                         | 0.000    | 3.078    | 4.753                  | 741.70              | -0.0180                      | 0.209             |
| 198.031                        | 0.000    | 2.545    | 6.025                  | 1173.18             | 0.0084                       | 0.206             |
| 393.307                        | 0.000    | 2.853    | 7.712                  | 1901.45             | -0.0067                      | 0.204             |
| 778.127                        | 0.000    | 2.653    | 9.755                  | 3022.90             | 0.0033                       | 0.202             |
| 1572.414                       | 0.000    | 2.768    | 12.464                 | 4914.13             | -0.0025                      | 0.201             |
| 2647.299                       | 0.000    | 2.744    | 16.281                 | 8361.26             | -0.0012                      | 0.201             |
| 2657.920                       | 0.000    | 2.804    | 16.322                 | 8402.68             | -0.0042                      | 0.201             |

NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 2.5078 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 254.8097 B = 2.67 M  
 MAXIMUM RISE (CENTER) = 3.4240 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 402.7245 B = 3.44 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 4 JETLAG 2000  
 TITLE Jet4

INPUT PARAMETERS

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.66E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.7069 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 3.0675 (m)       |
| po       | ... | 0.99827(g/cc) | sm    | ... | 35.3678          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 4.9968           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0173           |

Fd ... 54.31  
Uj/Ua ... 35.37

lm/lb ... 2.6605  
lm/lb ... 4.3395

Coflowing case:  
dmj ... 0.1375  
lm\* ... 1.8539  
Sm\* ... 34.3678

Stratification case:  
T ... -4784.49

| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 7.074             |
| -0.175                         | 0.000    | 0.000    | 0.060                  | 1.95                | 7.5040                       | 3.475             |
| -0.529                         | 0.000    | 0.001    | 0.122                  | 3.86                | 3.7785                       | 1.644             |
| -1.236                         | 0.000    | 0.009    | 0.259                  | 7.65                | 1.9031                       | 0.727             |
| -2.564                         | 0.000    | 0.097    | 0.559                  | 14.42               | 1.0055                       | 0.293             |
| -4.346                         | 0.000    | 0.694    | 1.038                  | 22.90               | 0.6089                       | 0.135             |
| -4.676                         | 0.000    | 1.137    | 1.683                  | 33.86               | 0.3941                       | 0.076             |
| -4.367                         | 0.000    | 1.499    | 1.979                  | 62.61               | 0.1994                       | 0.102             |
| -2.271                         | 0.000    | 2.292    | 2.300                  | 123.38              | 0.0720                       | 0.149             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| 3.406                          | 0.000    | 3.466    | 3.008                  | 246.20              | -0.0066                      | 0.173             |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| 24.088                         | 0.000    | 3.949    | 3.804                  | 417.17              | -0.0174                      | 0.184             |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 65.868                         | 0.000    | 3.924    | 4.940                  | 729.75              | -0.0185                      | 0.190             |
| 155.175                        | 0.000    | 3.310    | 6.167                  | 1158.53             | 0.0122                       | 0.194             |
| 334.327                        | 0.000    | 3.506    | 7.765                  | 1858.27             | 0.0024                       | 0.196             |
| 694.819                        | 0.000    | 3.649    | 9.793                  | 2977.26             | -0.0045                      | 0.198             |
| 1453.027                       | 0.000    | 3.504    | 12.472                 | 4851.61             | 0.0026                       | 0.199             |
| 1464.459                       | 0.000    | 3.491    | 12.503                 | 4875.27             | 0.0032                       | 0.199             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.3273 M ABOVE DISCHARGE PORT

AVG DILUTION = 229.4070 B = 2.92 M

MAXIMUM RISE (CENTER) = 4.3286 M ABOVE DISCHARGE PORT

AVG DILUTION = 364.2120 B = 3.58 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 5 JETLAG 2000  
TITLE Jet5

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500

PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.66E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.7069 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 3.0675 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 4.9968           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0173           |
| Fd       | ... | 54.31         | lm/lb | ... | 2.6605           |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 4.3395           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.1375  |
| lm* | ... | 1.8539  |
| sm* | ... | 34.3678 |

Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

| X      | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)    | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000  | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 7.074             |
| 0.180  | 0.000 | 0.000 | 0.058           | 1.95                | 7.5026                       | 3.672             |
| 0.545  | 0.000 | 0.001 | 0.112           | 3.86                | 3.7764                       | 1.942             |
| 1.275  | 0.000 | 0.006 | 0.213           | 7.67                | 1.8983                       | 1.074             |
| 2.742  | 0.000 | 0.041 | 0.390           | 15.26               | 0.9518                       | 0.639             |
| 5.640  | 0.000 | 0.227 | 0.678           | 30.44               | 0.4701                       | 0.421             |
| 9.444  | 0.000 | 0.672 | 1.113           | 60.83               | 0.2190                       | 0.313             |
| 14.335 | 0.000 | 1.387 | 1.733           | 121.56              | 0.0837                       | 0.258             |
| 22.014 | 0.000 | 2.419 | 2.598           | 242.74              | 0.0045                       | 0.229             |

NEUTRAL BUOYANCY LEVEL REACHED

MAXIMUM RISE REACHED

|        |       |       |       |        |         |       |
|--------|-------|-------|-------|--------|---------|-------|
| 44.235 | 0.000 | 3.315 | 3.519 | 420.30 | -0.0295 | 0.216 |
|--------|-------|-------|-------|--------|---------|-------|

TRAPPING LEVEL REACHED

|          |       |       |        |         |         |       |
|----------|-------|-------|--------|---------|---------|-------|
| 96.046   | 0.000 | 3.078 | 4.753  | 741.70  | -0.0180 | 0.209 |
| 198.031  | 0.000 | 2.545 | 6.025  | 1173.18 | 0.0084  | 0.206 |
| 393.307  | 0.000 | 2.853 | 7.712  | 1901.45 | -0.0067 | 0.204 |
| 778.127  | 0.000 | 2.653 | 9.755  | 3022.90 | 0.0033  | 0.202 |
| 1572.414 | 0.000 | 2.768 | 12.464 | 4914.13 | -0.0025 | 0.201 |
| 2647.299 | 0.000 | 2.744 | 16.281 | 8361.26 | -0.0012 | 0.201 |
| 2657.920 | 0.000 | 2.804 | 16.322 | 8402.68 | -0.0042 | 0.201 |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.5078 M ABOVE DISCHARGE PORT

AVG DILUTION = 254.8097 B = 2.67 M

MAXIMUM RISE (CENTER) = 3.4240 M ABOVE DISCHARGE PORT

AVG DILUTION = 402.7245 B = 3.44 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

|          |      |             |
|----------|------|-------------|
| CASE NO. | 6    | JETLAG 2000 |
| TITLE    | Jet6 |             |

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |   |                      |
|----------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS     | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : | STANDARD             |
| TIME STEP CONTRL           | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : | 1500                 |
| PRINTOUT INTERVAL          | : | 100                  |
| MAX NUMBER OF ITERATIONS   | : | 5                    |
| ITERATION ERROR BOUND      | : | 0.00100              |
| APPROX RATIO OF MASS/DMASS | : | 144.0                |

# ENVIROMENTAL CONDITIONS

^^

|         |          |       |       |        |        |
|---------|----------|-------|-------|--------|--------|
|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| .....   | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
| AMBIENT | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

# LENGTH & DILUTION SCALES

^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.66E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.7069 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 3.0675 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 4.9968           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0173           |
| Fd       | ... | 54.31         | lm/lb | ... | 2.6605           |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 4.3395           |

## Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.1375  |
| lm* | ... | 1.8539  |
| Sm* | ... | 34.3678 |

## Stratification case:

|   |     |          |
|---|-----|----------|
| T | ... | -4784.49 |
|---|-----|----------|

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 7.074             |
| -0.175                         | 0.000 | 0.000 | 0.060           | 1.95                | 7.5040                       | 3.475             |
| -0.529                         | 0.000 | 0.001 | 0.122           | 3.86                | 3.7785                       | 1.644             |
| -1.236                         | 0.000 | 0.009 | 0.259           | 7.65                | 1.9031                       | 0.727             |
| -2.564                         | 0.000 | 0.097 | 0.559           | 14.42               | 1.0055                       | 0.293             |
| -4.346                         | 0.000 | 0.694 | 1.038           | 22.90               | 0.6089                       | 0.135             |
| -4.676                         | 0.000 | 1.137 | 1.683           | 33.86               | 0.3941                       | 0.076             |
| -4.367                         | 0.000 | 1.499 | 1.979           | 62.61               | 0.1994                       | 0.102             |
| -2.271                         | 0.000 | 2.292 | 2.300           | 123.38              | 0.0720                       | 0.149             |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |                   |
| 3.406                          | 0.000 | 3.466 | 3.008           | 246.20              | -0.0066                      | 0.173             |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |                   |
| 24.088                         | 0.000 | 3.949 | 3.804           | 417.17              | -0.0174                      | 0.184             |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |                   |
| 65.868                         | 0.000 | 3.924 | 4.940           | 729.75              | -0.0185                      | 0.190             |
| 155.175                        | 0.000 | 3.310 | 6.167           | 1158.53             | 0.0122                       | 0.194             |
| 334.327                        | 0.000 | 3.506 | 7.765           | 1858.27             | 0.0024                       | 0.196             |
| 694.819                        | 0.000 | 3.649 | 9.793           | 2977.26             | -0.0045                      | 0.198             |
| 1453.027                       | 0.000 | 3.504 | 12.472          | 4851.61             | 0.0026                       | 0.199             |
| 1464.459                       | 0.000 | 3.491 | 12.503          | 4875.27             | 0.0032                       | 0.199             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.3273 M ABOVE DISCHARGE PORT

AVG DILUTION = 229.4070 B = 2.92 M

MAXIMUM RISE (CENTER) = 4.3286 M ABOVE DISCHARGE PORT

AVG DILUTION = 364.2120 B = 3.58 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

..... JETLAG 2000

CASE NO. 7

TITLE Jet7



# INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

## ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

## LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.66E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.7069 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 3.0675 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 4.9968           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0173           |
| Fd       | ... | 54.31         | lm/lb | ... | 2.6605           |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 4.3395           |

### Coflowing case:

dMj ... 0.1375  
lm\* ... 1.8539  
Sm\* ... 34.3678

### Stratification case:

T ... -4784.49

| X                              | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------------------------------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)                            | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000                          | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 7.074    |
| 0.180                          | 0.000 | 0.000 | 0.058           | 1.95                | 7.5026                       | 3.672    |
| 0.545                          | 0.000 | 0.001 | 0.112           | 3.86                | 3.7764                       | 1.942    |
| 1.275                          | 0.000 | 0.006 | 0.213           | 7.67                | 1.8983                       | 1.074    |
| 2.742                          | 0.000 | 0.041 | 0.390           | 15.26               | 0.9518                       | 0.639    |
| 5.640                          | 0.000 | 0.227 | 0.678           | 30.44               | 0.4701                       | 0.421    |
| 9.444                          | 0.000 | 0.672 | 1.113           | 60.83               | 0.2190                       | 0.313    |
| 14.335                         | 0.000 | 1.387 | 1.733           | 121.56              | 0.0837                       | 0.258    |
| 22.014                         | 0.000 | 2.419 | 2.598           | 242.74              | 0.0045                       | 0.229    |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |                 |                     |                              |          |
| MAXIMUM RISE REACHED           |       |       |                 |                     |                              |          |
| 44.235                         | 0.000 | 3.315 | 3.519           | 420.30              | -0.0295                      | 0.216    |
| TRAPPING LEVEL REACHED         |       |       |                 |                     |                              |          |
| 96.046                         | 0.000 | 3.078 | 4.753           | 741.70              | -0.0180                      | 0.209    |
| 198.031                        | 0.000 | 2.545 | 6.025           | 1173.18             | 0.0084                       | 0.206    |
| 393.307                        | 0.000 | 2.853 | 7.712           | 1901.45             | -0.0067                      | 0.204    |
| 778.127                        | 0.000 | 2.653 | 9.755           | 3022.90             | 0.0033                       | 0.202    |
| 1572.414                       | 0.000 | 2.768 | 12.464          | 4914.13             | -0.0025                      | 0.201    |
| 2647.299                       | 0.000 | 2.744 | 16.281          | 8361.26             | -0.0012                      | 0.201    |
| 2657.920                       | 0.000 | 2.804 | 16.322          | 8402.68             | -0.0042                      | 0.201    |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 2.5078 M ABOVE DISCHARGE PORT

AVG DILUTION = 254.8097 B = 2.67 M

MAXIMUM RISE (CENTER) = 3.4240 M ABOVE DISCHARGE PORT  
AVG DILUTION = 402.7245 B = 3.44 M

1 COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 8 JETLAG 2000  
TITLE Jet8

#### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

#### ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

#### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0200 (m3/s) | Qj    | ... 2.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 1.41E-01 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 5.66E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 7.0736 (m/s)  | lm    | ... 1.8806 (m)       |
| ua       | ... 0.2000 (m/s)  | lb    | ... 0.7069 (m)       |
| dp/pa    | ... 0.02883       | lm    | ... 3.0675 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 35.3678          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 4.9968           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0283           |
| Hor. ang | ... 180.00        | lQ/lm | ... 0.0173           |
| Fd       | ... 54.31         | lm/lb | ... 2.6605           |
| Uj/Ua    | ... 35.37         | lm/lb | ... 4.3395           |

Coflowing case:

dMj ... 0.1375  
lm\* ... 1.8539  
Sm\* ... 34.3678

Stratification case:

T ... -4784.49

| X                              | Y     | Z     | PLUME RADIUS | AVERAGE DILUTION | DENSITY DIFF. (sigmat) | VELOCITY (m/s) |
|--------------------------------|-------|-------|--------------|------------------|------------------------|----------------|
| (m)                            | (m)   | (m)   | (m)          |                  |                        |                |
| 0.000                          | 0.000 | 0.000 | 0.030        | 1.00             | 29.6379                | 7.074          |
| -0.175                         | 0.000 | 0.000 | 0.060        | 1.95             | 7.5040                 | 3.475          |
| -0.529                         | 0.000 | 0.001 | 0.122        | 3.86             | 3.7785                 | 1.644          |
| -1.236                         | 0.000 | 0.009 | 0.259        | 7.65             | 1.9031                 | 0.727          |
| -2.564                         | 0.000 | 0.097 | 0.559        | 14.42            | 1.0055                 | 0.293          |
| -4.346                         | 0.000 | 0.694 | 1.038        | 22.90            | 0.6089                 | 0.135          |
| -4.676                         | 0.000 | 1.137 | 1.683        | 33.86            | 0.3941                 | 0.076          |
| -4.367                         | 0.000 | 1.499 | 1.979        | 62.61            | 0.1994                 | 0.102          |
| -2.271                         | 0.000 | 2.292 | 2.300        | 123.38           | 0.0720                 | 0.149          |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |              |                  |                        |                |
| 3.406                          | 0.000 | 3.466 | 3.008        | 246.20           | -0.0066                | 0.173          |
| MAXIMUM RISE REACHED           |       |       |              |                  |                        |                |
| 24.088                         | 0.000 | 3.949 | 3.804        | 417.17           | -0.0174                | 0.184          |
| TRAPPING LEVEL REACHED         |       |       |              |                  |                        |                |

|          |       |       |        |         |         |       |
|----------|-------|-------|--------|---------|---------|-------|
| 65.868   | 0.000 | 3.924 | 4.940  | 729.75  | -0.0185 | 0.190 |
| 155.175  | 0.000 | 3.310 | 6.167  | 1158.53 | 0.0122  | 0.194 |
| 334.327  | 0.000 | 3.506 | 7.765  | 1858.27 | 0.0024  | 0.196 |
| 694.819  | 0.000 | 3.649 | 9.793  | 2977.26 | -0.0045 | 0.198 |
| 1453.027 | 0.000 | 3.504 | 12.472 | 4851.61 | 0.0026  | 0.199 |
| 1464.459 | 0.000 | 3.491 | 12.503 | 4875.27 | 0.0032  | 0.199 |

NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 3.3273 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 229.4070 B = 2.92 M  
 MAXIMUM RISE (CENTER) = 4.3286 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 364.2120 B = 3.58 M

1 COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 9 JETLAG 2000  
 TITLE Jet9

INPUT PARAMETERS

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

|         |          |       |       |        |        |
|---------|----------|-------|-------|--------|--------|
|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.66E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.7069 (m)       |
| dp/pa    | ... | 0.02883       | lM    | ... | 3.0675 (m)       |
| po       | ... | 0.99827(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02790(g/cc) | Sb    | ... | 4.9968           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0173           |
| Fd       | ... | 54.31         | lm/lb | ... | 2.6605           |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 4.3395           |

Coflowing case:

dMj ... 0.1375  
 lm\* ... 1.8539  
 Sm\* ... 34.3678

Stratification case:

T ... -4784.49

| X     | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|-------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)   | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000 | 0.000 | 0.000 | 0.030           | 1.00                | 29.6379                      | 7.074    |
| 0.180 | 0.000 | 0.000 | 0.058           | 1.95                | 7.5026                       | 3.672    |
| 0.545 | 0.000 | 0.001 | 0.112           | 3.86                | 3.7764                       | 1.942    |
| 1.275 | 0.000 | 0.006 | 0.213           | 7.67                | 1.8983                       | 1.074    |

|                                |       |       |        |         |         |       |
|--------------------------------|-------|-------|--------|---------|---------|-------|
| 2.742                          | 0.000 | 0.041 | 0.390  | 15.26   | 0.9518  | 0.639 |
| 5.640                          | 0.000 | 0.227 | 0.678  | 30.44   | 0.4701  | 0.421 |
| 9.444                          | 0.000 | 0.672 | 1.113  | 60.83   | 0.2190  | 0.313 |
| 14.335                         | 0.000 | 1.387 | 1.733  | 121.56  | 0.0837  | 0.258 |
| 22.014                         | 0.000 | 2.419 | 2.598  | 242.74  | 0.0045  | 0.229 |
| NEUTRAL BUOYANCY LEVEL REACHED |       |       |        |         |         |       |
| MAXIMUM RISE REACHED           |       |       |        |         |         |       |
| 44.235                         | 0.000 | 3.315 | 3.519  | 420.30  | -0.0295 | 0.216 |
| TRAPPING LEVEL REACHED         |       |       |        |         |         |       |
| 96.046                         | 0.000 | 3.078 | 4.753  | 741.70  | -0.0180 | 0.209 |
| 198.031                        | 0.000 | 2.545 | 6.025  | 1173.18 | 0.0084  | 0.206 |
| 393.307                        | 0.000 | 2.853 | 7.712  | 1901.45 | -0.0067 | 0.204 |
| 778.127                        | 0.000 | 2.653 | 9.755  | 3022.90 | 0.0033  | 0.202 |
| 1572.414                       | 0.000 | 2.768 | 12.464 | 4914.13 | -0.0025 | 0.201 |
| 2647.299                       | 0.000 | 2.744 | 16.281 | 8361.26 | -0.0012 | 0.201 |
| 2657.920                       | 0.000 | 2.804 | 16.322 | 8402.68 | -0.0042 | 0.201 |

NUMBER OF STEPS = 1500  
 NEUTRAL BUOYANCY LEVEL = 2.5078 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 254.8097 B = 2.67 M  
 MAXIMUM RISE (CENTER) = 3.4240 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 402.7245 B = 3.44 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 10 JETLAG 2000  
 TITLE Jet10

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 20.00 | -1.73  | 7.074  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 37.00 | 25.00 | 24.88  | 0.200  |
|         | 30.00    | 38.50 | 18.00 | 27.97  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^  

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0200 (m3/s) | Qj    | ... 2.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 1.41E-01 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 5.66E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 7.0736 (m/s)  | lm    | ... 1.8806 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.7069 (m)       |
| dp/pa    | ... 0.02883       | lM    | ... 3.0675 (m)       |
| po       | ... 0.99827(g/cc) | Sm    | ... 35.3678          |
| pa       | ... 1.02790(g/cc) | Sb    | ... 4.9968           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0283           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0173           |
| Fd       | ... 54.31         | lm/lb | ... 2.6605           |
| Uj/Ua    | ... 35.37         | lM/lb | ... 4.3395           |

Coflowing case:  
 dmj ... 0.1375  
 lm\* ... 1.8539  
 Sm\* ... 34.3678

Stratification case:  
 T ... -4784.49

| X<br>(m)                       | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------------------------------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000                          | 0.000    | 0.000    | 0.030                  | 1.00                | 29.6379                      | 7.074             |
| -0.175                         | 0.000    | 0.000    | 0.060                  | 1.95                | 7.5040                       | 3.475             |
| -0.529                         | 0.000    | 0.001    | 0.122                  | 3.86                | 3.7785                       | 1.644             |
| -1.236                         | 0.000    | 0.009    | 0.259                  | 7.65                | 1.9031                       | 0.727             |
| -2.564                         | 0.000    | 0.097    | 0.559                  | 14.42               | 1.0055                       | 0.293             |
| -4.346                         | 0.000    | 0.694    | 1.038                  | 22.90               | 0.6089                       | 0.135             |
| -4.676                         | 0.000    | 1.137    | 1.683                  | 33.86               | 0.3941                       | 0.076             |
| -4.367                         | 0.000    | 1.499    | 1.979                  | 62.61               | 0.1994                       | 0.102             |
| -2.271                         | 0.000    | 2.292    | 2.300                  | 123.38              | 0.0720                       | 0.149             |
| NEUTRAL BUOYANCY LEVEL REACHED |          |          |                        |                     |                              |                   |
| 3.406                          | 0.000    | 3.466    | 3.008                  | 246.20              | -0.0066                      | 0.173             |
| MAXIMUM RISE REACHED           |          |          |                        |                     |                              |                   |
| 24.088                         | 0.000    | 3.949    | 3.804                  | 417.17              | -0.0174                      | 0.184             |
| TRAPPING LEVEL REACHED         |          |          |                        |                     |                              |                   |
| 65.868                         | 0.000    | 3.924    | 4.940                  | 729.75              | -0.0185                      | 0.190             |
| 155.175                        | 0.000    | 3.310    | 6.167                  | 1158.53             | 0.0122                       | 0.194             |
| 334.327                        | 0.000    | 3.506    | 7.765                  | 1858.27             | 0.0024                       | 0.196             |
| 694.819                        | 0.000    | 3.649    | 9.793                  | 2977.26             | -0.0045                      | 0.198             |
| 1453.027                       | 0.000    | 3.504    | 12.472                 | 4851.61             | 0.0026                       | 0.199             |
| 1464.459                       | 0.000    | 3.491    | 12.503                 | 4875.27             | 0.0032                       | 0.199             |

NUMBER OF STEPS = 1500

NEUTRAL BUOYANCY LEVEL = 3.3273 M ABOVE DISCHARGE PORT

AVG DILUTION = 229.4070 B = 2.92 M

MAXIMUM RISE (CENTER) = 4.3286 M ABOVE DISCHARGE PORT

AVG DILUTION = 364.2120 B = 3.58 M

COMPUTATIONS CEASE: NUMBER OF STEPS EXCEEDS 1500 (PARAMETER ITERB)

### SIMULACIÓN 13

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 1 JETLAG 2000  
TITLE Jet1

#### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

#### ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

#### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |    |     |                  |
|----------|-----|---------------|----|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj | ... | 2.58E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm | ... | 1.8806 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb | ... | 2.5844 (m)       |
| dp/pa    | ... | 0.02635       | lm | ... | 1.6043 (m)       |

|          |     |               |       |     |         |
|----------|-----|---------------|-------|-----|---------|
| po       | ... | 0.99916(g/cc) | Sm    | ... | 35.3678 |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 66.7919 |
| Ver. ang | ... | 0.00          | lq/lm | ... | 0.0283  |
| Hor. ang | ... | 90.00         | lQ/lM | ... | 0.0331  |
| Fd       | ... | 28.40         | lm/lb | ... | 0.7277  |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 0.6207  |

| X      | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------|-------|--------|-----------------|---------------------|------------------------------|----------|
| (m)    | (m)   | (m)    | (m)             |                     |                              | (m/s)    |
| 0.000  | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 3.537    |
| 0.002  | 0.178 | 0.000  | 0.059           | 1.97                | 13.5224                      | 1.794    |
| 0.022  | 0.542 | 0.006  | 0.117           | 3.87                | 6.8918                       | 0.904    |
| 0.099  | 1.108 | 0.038  | 0.230           | 7.68                | 3.4609                       | 0.462    |
| 0.299  | 1.793 | 0.152  | 0.440           | 15.29               | 1.7353                       | 0.251    |
| 0.722  | 2.488 | 0.430  | 0.772           | 30.50               | 0.8694                       | 0.163    |
| 1.588  | 3.182 | 1.036  | 1.206           | 60.87               | 0.4354                       | 0.133    |
| 3.166  | 3.816 | 2.148  | 1.769           | 121.61              | 0.2179                       | 0.124    |
| 5.654  | 4.315 | 3.754  | 2.569           | 243.08              | 0.1090                       | 0.117    |
| 9.581  | 4.707 | 5.921  | 3.714           | 485.85              | 0.0545                       | 0.112    |
| 15.938 | 5.023 | 8.838  | 5.340           | 970.97              | 0.0273                       | 0.108    |
| 26.414 | 5.284 | 12.809 | 7.640           | 1940.38             | 0.0137                       | 0.106    |
| 43.834 | 5.501 | 18.271 | 10.893          | 3877.54             | 0.0068                       | 0.104    |
| 72.930 | 5.682 | 25.842 | 15.489          | 7748.56             | 0.0034                       | 0.103    |
| 88.104 | 5.741 | 29.343 | 17.636          | 10010.69            | 0.0026                       | 0.102    |

NUMBER OF STEPS = 1335  
 SURFACE LAYER (CENTER) LEVEL = 18.36 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 3913.45

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 9981.14

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 CASE NO. 2 JETLAG 2000  
 TITLE Jet2

INPUT PARAMETERS  
 ^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^  

|         |          |       |       |        |        |
|---------|----------|-------|-------|--------|--------|
|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^  

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.58E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 2.5844 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 1.6043 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 66.7919          |
| Ver. ang | ... | 0.00          | lq/lm | ... | 0.0283           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0331           |

Fd ... 28.40 1m/lb ... 0.7277  
Uj/Ua ... 35.37 1M/lb ... 0.6207

| X      | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF. | VELOCITY |
|--------|-------|--------|-----------------|---------------------|------------------|----------|
| (m)    | (m)   | (m)    | (m)             |                     | (sigmat)         | (m/s)    |
| 0.000  | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447          | 3.537    |
| -0.175 | 0.000 | 0.000  | 0.060           | 1.98                | 13.5224          | 1.738    |
| -0.528 | 0.000 | 0.006  | 0.123           | 3.89                | 6.8612           | 0.823    |
| -1.227 | 0.000 | 0.065  | 0.258           | 7.70                | 3.4512           | 0.367    |
| -2.390 | 0.000 | 0.550  | 0.502           | 14.69               | 1.8067           | 0.185    |
| -2.856 | 0.000 | 1.293  | 0.904           | 29.37               | 0.9027           | 0.115    |
| -2.774 | 0.000 | 1.868  | 1.433           | 58.74               | 0.4512           | 0.091    |
| -2.177 | 0.000 | 2.568  | 1.986           | 116.59              | 0.2273           | 0.094    |
| -0.344 | 0.000 | 3.952  | 2.694           | 232.90              | 0.1138           | 0.102    |
| 3.091  | 0.000 | 5.992  | 3.761           | 465.49              | 0.0569           | 0.105    |
| 8.953  | 0.000 | 8.786  | 5.316           | 930.30              | 0.0285           | 0.105    |
| 18.868 | 0.000 | 12.632 | 7.542           | 1859.14             | 0.0143           | 0.104    |
| 35.558 | 0.000 | 17.951 | 10.706          | 3715.24             | 0.0071           | 0.103    |
| 63.594 | 0.000 | 25.346 | 15.192          | 7424.27             | 0.0036           | 0.102    |
| 80.896 | 0.000 | 29.365 | 17.655          | 9998.72             | 0.0026           | 0.102    |

NUMBER OF STEPS = 1341  
SURFACE LAYER (CENTER) LEVEL = 18.35 M ABOVE DISCHARGE PORT  
AVG DILUTION = 3882.61

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 9954.17

1 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 3 JETLAG 2000  
TITLE Jet3

INPUT PARAMETERS  
AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES  
AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0100 (m3/s) | Qj    | ... 1.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 3.54E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 2.58E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 3.5368 (m/s)  | lm    | ... 1.8806 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb    | ... 2.5844 (m)       |
| dp/pa    | ... 0.02635       | lM    | ... 1.6043 (m)       |
| po       | ... 0.99916(g/cc) | sm    | ... 35.3678          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 66.7919          |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0283           |
| Hor. ang | ... 0.00          | lQ/lM | ... 0.0331           |
| Fd       | ... 28.40         | lm/lb | ... 0.7277           |
| Uj/Ua    | ... 35.37         | lM/lb | ... 0.6207           |

Coflowing case:

dmj ... 0.0344  
lm\* ... 1.8539  
Sm\* ... 34.3678

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|---------|-------|--------|-----------------|---------------------|------------------------------|----------|
| (m)     | (m)   | (m)    | (m)             |                     |                              | (m/s)    |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 3.537    |
| 0.180   | 0.000 | 0.000  | 0.059           | 1.98                | 13.5224                      | 1.836    |
| 0.543   | 0.000 | 0.005  | 0.113           | 3.89                | 6.8573                       | 0.971    |
| 1.268   | 0.000 | 0.044  | 0.213           | 7.71                | 3.4468                       | 0.539    |
| 2.589   | 0.000 | 0.260  | 0.386           | 15.34               | 1.7295                       | 0.328    |
| 4.122   | 0.000 | 0.781  | 0.655           | 30.64               | 0.8655                       | 0.228    |
| 5.709   | 0.000 | 1.550  | 1.055           | 61.22               | 0.4330                       | 0.175    |
| 7.652   | 0.000 | 2.610  | 1.637           | 122.36              | 0.2166                       | 0.145    |
| 10.287  | 0.000 | 4.010  | 2.470           | 244.57              | 0.1083                       | 0.128    |
| 14.201  | 0.000 | 5.869  | 3.648           | 488.78              | 0.0542                       | 0.117    |
| 20.398  | 0.000 | 8.397  | 5.303           | 976.73              | 0.0271                       | 0.111    |
| 30.547  | 0.000 | 11.899 | 7.629           | 1951.71             | 0.0136                       | 0.107    |
| 47.436  | 0.000 | 16.807 | 10.903          | 3899.94             | 0.0068                       | 0.104    |
| 75.729  | 0.000 | 23.728 | 15.522          | 7792.97             | 0.0034                       | 0.103    |
| 102.250 | 0.000 | 29.392 | 19.297          | 11970.19            | 0.0022                       | 0.102    |

NUMBER OF STEPS = 1360  
SURFACE LAYER (CENTER) LEVEL = 17.76 M ABOVE DISCHARGE PORT  
AVG DILUTION = 4356.71

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 11895.63

1  
ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
.....  
CASE NO. 4 JETLAG 2000  
TITLE Jet4

INPUT PARAMETERS  
^^^^^^^^^^^^^^^^^^^^  
ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
^^^^^^^^^^^^^^^^^^^^  
EXIT DEPTH(m) S T(C) SIGMAT U(m/s)  
29.30 0.00 15.00 -0.84 3.537  
.....  
AMBIENT 0.00 35.00 14.00 26.21 0.100  
30.00 35.00 14.00 26.21 0.100

LENGTH & DILUTION SCALES  
^^^^^^^^^^^^^^^^^^^^  
Total Q ... 0.0100 (m3/s) Qj ... 1.00E-02 (m3/s)  
Port No. ... 1 Mj ... 3.54E-02 (m4/s2)  
Depth ... 29.3000 (m) Bj ... 2.58E-03 (m4/s3)  
Diameter ... 0.0600 (m) lQ ... 0.0532 (m)  
Uj ... 3.5368 (m/s) lm ... 1.8806 (m)  
Ua ... 0.1000 (m/s) lb ... 2.5844 (m)  
dp/pa ... 0.02635 lm ... 1.6043 (m)  
po ... 0.99916(g/cc) Sm ... 35.3678  
pa ... 1.02621(g/cc) Sb ... 66.7919  
Ver. ang ... 0.00 lQ/lm ... 0.0283  
Hor. ang ... 180.00 lQ/lM ... 0.0331  
Fd ... 28.40 lm/lb ... 0.7277  
Uj/Ua ... 35.37 lM/lb ... 0.6207



Coflowing case:  
 dMj ... 0.0344  
 lm\* ... 1.8539  
 Sm\* ... 34.3678

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 3.537             |
| -0.175   | 0.000    | 0.000    | 0.060                  | 1.98                | 13.5224                      | 1.738             |
| -0.528   | 0.000    | 0.006    | 0.123                  | 3.89                | 6.8612                       | 0.823             |
| -1.227   | 0.000    | 0.065    | 0.258                  | 7.70                | 3.4512                       | 0.367             |
| -2.390   | 0.000    | 0.550    | 0.502                  | 14.69               | 1.8067                       | 0.185             |
| -2.856   | 0.000    | 1.293    | 0.904                  | 29.37               | 0.9027                       | 0.115             |
| -2.774   | 0.000    | 1.868    | 1.433                  | 58.74               | 0.4512                       | 0.091             |
| -2.177   | 0.000    | 2.568    | 1.986                  | 116.59              | 0.2273                       | 0.094             |
| -0.344   | 0.000    | 3.952    | 2.694                  | 232.90              | 0.1138                       | 0.102             |
| 3.091    | 0.000    | 5.992    | 3.761                  | 465.49              | 0.0569                       | 0.105             |
| 8.953    | 0.000    | 8.786    | 5.316                  | 930.30              | 0.0285                       | 0.105             |
| 18.868   | 0.000    | 12.632   | 7.542                  | 1859.14             | 0.0143                       | 0.104             |
| 35.558   | 0.000    | 17.951   | 10.706                 | 3715.24             | 0.0071                       | 0.103             |
| 63.594   | 0.000    | 25.346   | 15.192                 | 7424.27             | 0.0036                       | 0.102             |
| 80.896   | 0.000    | 29.365   | 17.655                 | 9998.72             | 0.0026                       | 0.102             |

NUMBER OF STEPS = 1341  
 SURFACE LAYER (CENTER) LEVEL = 18.35 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 3882.61

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 9954.17

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 5 JETLAG 2000  
 TITLE Jet5

#### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

#### ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

#### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA  

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.58E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 2.5844 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 1.6043 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 66.7919          |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0331           |
| Fd       | ... | 28.40         | lm/lb | ... | 0.7277           |

Uj/Ua ... 35.37

lM/lb ... 0.6207

Coflowing case:

dMj ... 0.0344

lM\* ... 1.8539

Sm\* ... 34.3678

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF. | VELOCITY |
|---------|-------|--------|-----------------|---------------------|------------------|----------|
| (m)     | (m)   | (m)    | (m)             |                     | (sigmat)         | (m/s)    |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447          | 3.537    |
| 0.180   | 0.000 | 0.000  | 0.059           | 1.98                | 13.5224          | 1.836    |
| 0.543   | 0.000 | 0.005  | 0.113           | 3.89                | 6.8573           | 0.971    |
| 1.268   | 0.000 | 0.044  | 0.213           | 7.71                | 3.4468           | 0.539    |
| 2.589   | 0.000 | 0.260  | 0.386           | 15.34               | 1.7295           | 0.328    |
| 4.122   | 0.000 | 0.781  | 0.655           | 30.64               | 0.8655           | 0.228    |
| 5.709   | 0.000 | 1.550  | 1.055           | 61.22               | 0.4330           | 0.175    |
| 7.652   | 0.000 | 2.610  | 1.637           | 122.36              | 0.2166           | 0.145    |
| 10.287  | 0.000 | 4.010  | 2.470           | 244.57              | 0.1083           | 0.128    |
| 14.201  | 0.000 | 5.869  | 3.648           | 488.78              | 0.0542           | 0.117    |
| 20.398  | 0.000 | 8.397  | 5.303           | 976.73              | 0.0271           | 0.111    |
| 30.547  | 0.000 | 11.899 | 7.629           | 1951.71             | 0.0136           | 0.107    |
| 47.436  | 0.000 | 16.807 | 10.903          | 3899.94             | 0.0068           | 0.104    |
| 75.729  | 0.000 | 23.728 | 15.522          | 7792.97             | 0.0034           | 0.103    |
| 102.250 | 0.000 | 29.392 | 19.297          | 11970.19            | 0.0022           | 0.102    |

NUMBER OF STEPS = 1360

SURFACE LAYER (CENTER) LEVEL = 17.76 M ABOVE DISCHARGE PORT

AVG DILUTION = 4356.71

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 11895.63

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 6 JETLAG 2000

TITLE Jet6

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.58E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lM    | ... | 1.8806 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 2.5844 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 1.6043 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 66.7919          |
| Ver. ang | ... | 0.00          | lQ/lM | ... | 0.0283           |

Hor. ang ... 180.00      lQ/lM ... 0.0331  
 Fd ... 28.40      lm/lb ... 0.7277  
 Uj/Ua ... 35.37      lM/lb ... 0.6207

Coflowing case:  
 dMj ... 0.0344  
 lm\* ... 1.8539  
 sm\* ... 34.3678

| X      | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------|-------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)    | (m)   | (m)    | (m)             |                     |                              |                   |
| 0.000  | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 3.537             |
| -0.175 | 0.000 | 0.000  | 0.060           | 1.98                | 13.5224                      | 1.738             |
| -0.528 | 0.000 | 0.006  | 0.123           | 3.89                | 6.8612                       | 0.823             |
| -1.227 | 0.000 | 0.065  | 0.258           | 7.70                | 3.4512                       | 0.367             |
| -2.390 | 0.000 | 0.550  | 0.502           | 14.69               | 1.8067                       | 0.185             |
| -2.856 | 0.000 | 1.293  | 0.904           | 29.37               | 0.9027                       | 0.115             |
| -2.774 | 0.000 | 1.868  | 1.433           | 58.74               | 0.4512                       | 0.091             |
| -2.177 | 0.000 | 2.568  | 1.986           | 116.59              | 0.2273                       | 0.094             |
| -0.344 | 0.000 | 3.952  | 2.694           | 232.90              | 0.1138                       | 0.102             |
| 3.091  | 0.000 | 5.992  | 3.761           | 465.49              | 0.0569                       | 0.105             |
| 8.953  | 0.000 | 8.786  | 5.316           | 930.30              | 0.0285                       | 0.105             |
| 18.868 | 0.000 | 12.632 | 7.542           | 1859.14             | 0.0143                       | 0.104             |
| 35.558 | 0.000 | 17.951 | 10.706          | 3715.24             | 0.0071                       | 0.103             |
| 63.594 | 0.000 | 25.346 | 15.192          | 7424.27             | 0.0036                       | 0.102             |
| 80.896 | 0.000 | 29.365 | 17.655          | 9998.72             | 0.0026                       | 0.102             |

NUMBER OF STEPS = 1341  
 SURFACE LAYER (CENTER) LEVEL = 18.35 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 3882.61

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 9954.17

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 CASE NO. 7 JETLAG 2000  
 TITLE Jet7

INPUT PARAMETERS  
 ^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^  

|              |               |        |                  |
|--------------|---------------|--------|------------------|
| Total Q ...  | 0.0100 (m3/s) | Qj ... | 1.00E-02 (m3/s)  |
| Port No. ... | 1             | Mj ... | 3.54E-02 (m4/s2) |
| Depth ...    | 29.3000 (m)   | Bj ... | 2.58E-03 (m4/s3) |
| Diameter ... | 0.0600 (m)    | lQ ... | 0.0532 (m)       |
| Uj ...       | 3.5368 (m/s)  | lm ... | 1.8806 (m)       |
| Ua ...       | 0.1000 (m/s)  | lb ... | 2.5844 (m)       |
| dp/pa ...    | 0.02635       | lM ... | 1.6043 (m)       |
| po ...       | 0.99916(g/cc) | sm ... | 35.3678          |
| pa ...       | 1.02621(g/cc) | Sb ... | 66.7919          |

Ver. ang ... 0.00                      lQ/lm ... 0.0283  
 Hor. ang ... 0.00                      lQ/lm ... 0.0331  
 Fd ... 28.40                      lm/lb ... 0.7277  
 Uj/Ua ... 35.37                      lm/lb ... 0.6207

Coflowing case:  
 dmj ... 0.0344  
 lm\* ... 1.8539  
 Sm\* ... 34.3678

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 3.537             |
| 0.180    | 0.000    | 0.000    | 0.059                  | 1.98                | 13.5224                      | 1.836             |
| 0.543    | 0.000    | 0.005    | 0.113                  | 3.89                | 6.8573                       | 0.971             |
| 1.268    | 0.000    | 0.044    | 0.213                  | 7.71                | 3.4468                       | 0.539             |
| 2.589    | 0.000    | 0.260    | 0.386                  | 15.34               | 1.7295                       | 0.328             |
| 4.122    | 0.000    | 0.781    | 0.655                  | 30.64               | 0.8655                       | 0.228             |
| 5.709    | 0.000    | 1.550    | 1.055                  | 61.22               | 0.4330                       | 0.175             |
| 7.652    | 0.000    | 2.610    | 1.637                  | 122.36              | 0.2166                       | 0.145             |
| 10.287   | 0.000    | 4.010    | 2.470                  | 244.57              | 0.1083                       | 0.128             |
| 14.201   | 0.000    | 5.869    | 3.648                  | 488.78              | 0.0542                       | 0.117             |
| 20.398   | 0.000    | 8.397    | 5.303                  | 976.73              | 0.0271                       | 0.111             |
| 30.547   | 0.000    | 11.899   | 7.629                  | 1951.71             | 0.0136                       | 0.107             |
| 47.436   | 0.000    | 16.807   | 10.903                 | 3899.94             | 0.0068                       | 0.104             |
| 75.729   | 0.000    | 23.728   | 15.522                 | 7792.97             | 0.0034                       | 0.103             |
| 102.250  | 0.000    | 29.392   | 19.297                 | 11970.19            | 0.0022                       | 0.102             |

NUMBER OF STEPS = 1360  
 SURFACE LAYER (CENTER) LEVEL = 17.76 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 4356.71

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 11895.63

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 8 JETLAG 2000  
 TITLE Jet8

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100

APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^  

|          |                   |    |                      |
|----------|-------------------|----|----------------------|
| Total Q  | ... 0.0100 (m3/s) | Qj | ... 1.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj | ... 3.54E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj | ... 2.58E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ | ... 0.0532 (m)       |
| Uj       | ... 3.5368 (m/s)  | lm | ... 1.8806 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb | ... 2.5844 (m)       |
| dp/pa    | ... 0.02635       | lm | ... 1.6043 (m)       |

```

po      ... 0.99916(g/cc)      Sm ... 35.3678
pa      ... 1.02621(g/cc)      Sb ... 66.7919
Ver. ang ... 0.00              lQ/lm ... 0.0283
Hor. ang ... 180.00            lQ/lM ... 0.0331
Fd      ... 28.40              lm/lb ... 0.7277
Uj/Ua   ... 35.37              lM/lb ... 0.6207

```

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Coflowing case:
dmj     ... 0.0344
lm*     ... 1.8539
Sm*     ... 34.3678

```

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 3.537             |
| -0.175   | 0.000    | 0.000    | 0.060                  | 1.98                | 13.5224                      | 1.738             |
| -0.528   | 0.000    | 0.006    | 0.123                  | 3.89                | 6.8612                       | 0.823             |
| -1.227   | 0.000    | 0.065    | 0.258                  | 7.70                | 3.4512                       | 0.367             |
| -2.390   | 0.000    | 0.550    | 0.502                  | 14.69               | 1.8067                       | 0.185             |
| -2.856   | 0.000    | 1.293    | 0.904                  | 29.37               | 0.9027                       | 0.115             |
| -2.774   | 0.000    | 1.868    | 1.433                  | 58.74               | 0.4512                       | 0.091             |
| -2.177   | 0.000    | 2.568    | 1.986                  | 116.59              | 0.2273                       | 0.094             |
| -0.344   | 0.000    | 3.952    | 2.694                  | 232.90              | 0.1138                       | 0.102             |
| 3.091    | 0.000    | 5.992    | 3.761                  | 465.49              | 0.0569                       | 0.105             |
| 8.953    | 0.000    | 8.786    | 5.316                  | 930.30              | 0.0285                       | 0.105             |
| 18.868   | 0.000    | 12.632   | 7.542                  | 1859.14             | 0.0143                       | 0.104             |
| 35.558   | 0.000    | 17.951   | 10.706                 | 3715.24             | 0.0071                       | 0.103             |
| 63.594   | 0.000    | 25.346   | 15.192                 | 7424.27             | 0.0036                       | 0.102             |
| 80.896   | 0.000    | 29.365   | 17.655                 | 9998.72             | 0.0026                       | 0.102             |

NUMBER OF STEPS = 1341  
SURFACE LAYER (CENTER) LEVEL = 18.35 M ABOVE DISCHARGE PORT  
AVG DILUTION = 3882.61

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 9954.17

1  
ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
.....  
CASE NO. 9 JETLAG 2000  
TITLE Jet9

INPUT PARAMETERS  
^^^^^^^^^^^^^^^^^^^^  
ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
^^^^^^^^^^^^^^^^^^^^  
EXIT DEPTH(m) S T(C) SIGMAT U(m/s)  
29.30 0.00 15.00 -0.84 3.537  
.....  
AMBIENT 0.00 35.00 14.00 26.21 0.100  
30.00 35.00 14.00 26.21 0.100

LENGTH & DILUTION SCALES  
^^^^^^^^^^^^^^^^^^^^  
Total Q ... 0.0100 (m3/s) Qj ... 1.00E-02 (m3/s)  
Port No. ... 1 Mj ... 3.54E-02 (m4/s2)  
Depth ... 29.3000 (m) Bj ... 2.58E-03 (m4/s3)  
Diameter ... 0.0600 (m) lQ ... 0.0532 (m)  
Uj ... 3.5368 (m/s) lm ... 1.8806 (m)  
Ua ... 0.1000 (m/s) lb ... 2.5844 (m)

|          |     |               |       |     |            |
|----------|-----|---------------|-------|-----|------------|
| dp/pa    | ... | 0.02635       | lM    | ... | 1.6043 (m) |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 35.3678    |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 66.7919    |
| ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283     |
| Hor. ang | ... | 0.00          | lQ/lm | ... | 0.0331     |
| Fd       | ... | 28.40         | lm/lb | ... | 0.7277     |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 0.6207     |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0344  |
| lm* | ... | 1.8539  |
| Sm* | ... | 34.3678 |

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|---------|-------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)     | (m)   | (m)    | (m)             |                     |                              |                   |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 3.537             |
| 0.180   | 0.000 | 0.000  | 0.059           | 1.98                | 13.5224                      | 1.836             |
| 0.543   | 0.000 | 0.005  | 0.113           | 3.89                | 6.8573                       | 0.971             |
| 1.268   | 0.000 | 0.044  | 0.213           | 7.71                | 3.4468                       | 0.539             |
| 2.589   | 0.000 | 0.260  | 0.386           | 15.34               | 1.7295                       | 0.328             |
| 4.122   | 0.000 | 0.781  | 0.655           | 30.64               | 0.8655                       | 0.228             |
| 5.709   | 0.000 | 1.550  | 1.055           | 61.22               | 0.4330                       | 0.175             |
| 7.652   | 0.000 | 2.610  | 1.637           | 122.36              | 0.2166                       | 0.145             |
| 10.287  | 0.000 | 4.010  | 2.470           | 244.57              | 0.1083                       | 0.128             |
| 14.201  | 0.000 | 5.869  | 3.648           | 488.78              | 0.0542                       | 0.117             |
| 20.398  | 0.000 | 8.397  | 5.303           | 976.73              | 0.0271                       | 0.111             |
| 30.547  | 0.000 | 11.899 | 7.629           | 1951.71             | 0.0136                       | 0.107             |
| 47.436  | 0.000 | 16.807 | 10.903          | 3899.94             | 0.0068                       | 0.104             |
| 75.729  | 0.000 | 23.728 | 15.522          | 7792.97             | 0.0034                       | 0.103             |
| 102.250 | 0.000 | 29.392 | 19.297          | 11970.19            | 0.0022                       | 0.102             |

NUMBER OF STEPS = 1360

SURFACE LAYER (CENTER) LEVEL = 17.76 M ABOVE DISCHARGE PORT  
AVG DILUTION = 4356.71

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 11895.63

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 10 JETLAG 2000

TITLE Jet10

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |   |                      |
|----------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS     | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : | STANDARD             |
| TIME STEP CONTRL           | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : | 1500                 |
| PRINTOUT INTERVAL          | : | 100                  |
| MAX NUMBER OF ITERATIONS   | : | 5                    |
| ITERATION ERROR BOUND      | : | 0.00100              |
| APPROX RATIO OF MASS/DMASS | : | 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |    |     |                  |
|----------|-----|---------------|----|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj | ... | 2.58E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ | ... | 0.0532 (m)       |

|          |     |               |       |     |            |
|----------|-----|---------------|-------|-----|------------|
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 1.8806 (m) |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 2.5844 (m) |
| dp/pa    | ... | 0.02635       | lM    | ... | 1.6043 (m) |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 35.3678    |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 66.7919    |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283     |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0331     |
| Fd       | ... | 28.40         | lm/lb | ... | 0.7277     |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 0.6207     |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0344  |
| lm* | ... | 1.8539  |
| Sm* | ... | 34.3678 |

| X      | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF. | VELOCITY |
|--------|-------|--------|-----------------|---------------------|------------------|----------|
| (m)    | (m)   | (m)    | (m)             |                     | (sigmat)         | (m/s)    |
| 0.000  | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447          | 3.537    |
| -0.175 | 0.000 | 0.000  | 0.060           | 1.98                | 13.5224          | 1.738    |
| -0.528 | 0.000 | 0.006  | 0.123           | 3.89                | 6.8612           | 0.823    |
| -1.227 | 0.000 | 0.065  | 0.258           | 7.70                | 3.4512           | 0.367    |
| -2.390 | 0.000 | 0.550  | 0.502           | 14.69               | 1.8067           | 0.185    |
| -2.856 | 0.000 | 1.293  | 0.904           | 29.37               | 0.9027           | 0.115    |
| -2.774 | 0.000 | 1.868  | 1.433           | 58.74               | 0.4512           | 0.091    |
| -2.177 | 0.000 | 2.568  | 1.986           | 116.59              | 0.2273           | 0.094    |
| -0.344 | 0.000 | 3.952  | 2.694           | 232.90              | 0.1138           | 0.102    |
| 3.091  | 0.000 | 5.992  | 3.761           | 465.49              | 0.0569           | 0.105    |
| 8.953  | 0.000 | 8.786  | 5.316           | 930.30              | 0.0285           | 0.105    |
| 18.868 | 0.000 | 12.632 | 7.542           | 1859.14             | 0.0143           | 0.104    |
| 35.558 | 0.000 | 17.951 | 10.706          | 3715.24             | 0.0071           | 0.103    |
| 63.594 | 0.000 | 25.346 | 15.192          | 7424.27             | 0.0036           | 0.102    |
| 80.896 | 0.000 | 29.365 | 17.655          | 9998.72             | 0.0026           | 0.102    |

NUMBER OF STEPS = 1341

SURFACE LAYER (CENTER) LEVEL = 18.35 M ABOVE DISCHARGE PORT

AVG DILUTION = 3882.61

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 9954.17

#### **SIMULACIÓN 14**

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

|          |      |             |
|----------|------|-------------|
| CASE NO. | 1    | JETLAG 2000 |
| TITLE    | Jet1 |             |

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |                        |
|----------------------------|------------------------|
| ENTRAINMENT HYPOTHESIS     | : ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : STANDARD             |
| TIME STEP CONTRL           | : VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : 1500                 |
| PRINTOUT INTERVAL          | : 100                  |
| MAX NUMBER OF ITERATIONS   | : 5                    |
| ITERATION ERROR BOUND      | : 0.00100              |
| APPROX RATIO OF MASS/DMASS | : 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

# LENGTH & DILUTION SCALES

^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 3.88E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 2.8209 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 3.8766 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 2.4064 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 53.0516          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 100.1878         |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0188           |
| Hor. ang | ... | 90.00         | lQ/lM | ... | 0.0221           |
| Fd       | ... | 42.60         | lm/lb | ... | 0.7277           |
| Uj/Ua    | ... | 53.05         | lM/lb | ... | 0.6207           |

| X      | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------|-------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)    | (m)   | (m)    | (m)             |                     |                              |                   |
| 0.000  | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 5.305             |
| 0.002  | 0.177 | 0.000  | 0.059           | 1.98                | 13.5224                      | 2.681             |
| 0.015  | 0.545 | 0.003  | 0.117           | 3.87                | 6.8936                       | 1.354             |
| 0.076  | 1.221 | 0.022  | 0.231           | 7.67                | 3.4637                       | 0.684             |
| 0.263  | 2.169 | 0.110  | 0.453           | 15.27               | 1.7376                       | 0.356             |
| 0.685  | 3.210 | 0.365  | 0.842           | 30.46               | 0.8706                       | 0.205             |
| 1.549  | 4.251 | 0.945  | 1.407           | 60.79               | 0.4360                       | 0.147             |
| 3.269  | 5.280 | 2.156  | 2.121           | 121.41              | 0.2183                       | 0.129             |
| 6.151  | 6.147 | 4.134  | 3.094           | 242.67              | 0.1092                       | 0.121             |
| 10.650 | 6.822 | 6.870  | 4.486           | 485.07              | 0.0546                       | 0.115             |
| 17.819 | 7.359 | 10.542 | 6.473           | 969.50              | 0.0273                       | 0.110             |
| 29.520 | 7.797 | 15.505 | 9.288           | 1937.52             | 0.0137                       | 0.107             |
| 48.887 | 8.159 | 22.291 | 13.269          | 3871.91             | 0.0068                       | 0.105             |
| 72.577 | 8.399 | 29.326 | 17.486          | 6644.27             | 0.0040                       | 0.104             |

NUMBER OF STEPS = 1276

SURFACE LAYER (CENTER) LEVEL = 18.35 M ABOVE DISCHARGE PORT  
AVG DILUTION = 2662.50

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 6632.44

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

.....  
CASE NO. 2 JETLAG 2000  
TITLE Jet2

## INPUT PARAMETERS

^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|                            |   |                      |
|----------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS     | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : | STANDARD             |
| TIME STEP CONTRL           | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : | 1500                 |
| PRINTOUT INTERVAL          | : | 100                  |
| MAX NUMBER OF ITERATIONS   | : | 5                    |
| ITERATION ERROR BOUND      | : | 0.00100              |
| APPROX RATIO OF MASS/DMASS | : | 144.0                |

## ENVIROMENTAL CONDITIONS

^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

## LENGTH & DILUTION SCALES

^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|          |     |               |    |     |                  |
|----------|-----|---------------|----|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj | ... | 7.96E-02 (m4/s2) |



|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 3.88E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 2.8209 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 3.8766 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 2.4064 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 53.0516          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 100.1878         |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0188           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0221           |
| Fd       | ... | 42.60         | lm/lb | ... | 0.7277           |
| Uj/Ua    | ... | 53.05         | lM/lb | ... | 0.6207           |

| X      | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------|-------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)    | (m)   | (m)    | (m)             |                     |                              |                   |
| 0.000  | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 5.305             |
| -0.176 | 0.000 | 0.000  | 0.060           | 1.98                | 13.5224                      | 2.631             |
| -0.530 | 0.000 | 0.003  | 0.121           | 3.89                | 6.8605                       | 1.271             |
| -1.239 | 0.000 | 0.027  | 0.250           | 7.70                | 3.4506                       | 0.589             |
| -2.623 | 0.000 | 0.269  | 0.509           | 14.75               | 1.7988                       | 0.272             |
| -4.096 | 0.000 | 1.323  | 0.974           | 29.29               | 0.9054                       | 0.147             |
| -4.364 | 0.000 | 2.323  | 1.671           | 58.62               | 0.4522                       | 0.100             |
| -4.005 | 0.000 | 3.152  | 2.493           | 117.18              | 0.2262                       | 0.090             |
| -2.452 | 0.000 | 4.587  | 3.365           | 232.66              | 0.1139                       | 0.098             |
| 1.244  | 0.000 | 7.098  | 4.623           | 464.95              | 0.0570                       | 0.104             |
| 7.681  | 0.000 | 10.582 | 6.500           | 929.26              | 0.0285                       | 0.105             |
| 18.616 | 0.000 | 15.362 | 9.209           | 1857.14             | 0.0143                       | 0.105             |
| 37.066 | 0.000 | 21.953 | 13.073          | 3711.39             | 0.0071                       | 0.104             |
| 61.617 | 0.000 | 29.317 | 17.484          | 6593.27             | 0.0040                       | 0.103             |

NUMBER OF STEPS = 1281

SURFACE LAYER (CENTER) LEVEL = 18.35 M ABOVE DISCHARGE PORT

AVG DILUTION = 2614.45

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 6585.55

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 3 JETLAG 2000  
TITLE Jet3

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |    |     |                  |
|----------|-----|---------------|----|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj | ... | 3.88E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm | ... | 2.8209 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb | ... | 3.8766 (m)       |
| dp/pa    | ... | 0.02635       | lM | ... | 2.4064 (m)       |

|          |     |               |       |     |          |
|----------|-----|---------------|-------|-----|----------|
| po       | ... | 0.99916(g/cc) | Sm    | ... | 53.0516  |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 100.1878 |
| Ver. ang | ... | 0.00          | lq/lm | ... | 0.0188   |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0221   |
| Fd       | ... | 42.60         | lm/lb | ... | 0.7277   |
| Uj/Ua    | ... | 53.05         | lM/lb | ... | 0.6207   |

Coflowing case:  
dmj ... 0.0781  
lm\* ... 2.7942  
Sm\* ... 52.0516

| X      | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------|-------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)    | (m)   | (m)    | (m)             |                     |                              |                   |
| 0.000  | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 5.305             |
| 0.179  | 0.000 | 0.000  | 0.059           | 1.98                | 13.5224                      | 2.730             |
| 0.540  | 0.000 | 0.002  | 0.114           | 3.89                | 6.8579                       | 1.419             |
| 1.264  | 0.000 | 0.021  | 0.220           | 7.71                | 3.4476                       | 0.762             |
| 2.692  | 0.000 | 0.145  | 0.410           | 15.32               | 1.7316                       | 0.436             |
| 4.923  | 0.000 | 0.658  | 0.723           | 30.57               | 0.8674                       | 0.280             |
| 7.234  | 0.000 | 1.595  | 1.200           | 61.10               | 0.4338                       | 0.203             |
| 9.792  | 0.000 | 2.920  | 1.902           | 122.13              | 0.2170                       | 0.161             |
| 13.065 | 0.000 | 4.707  | 2.916           | 244.14              | 0.1085                       | 0.137             |
| 17.679 | 0.000 | 7.061  | 4.360           | 487.98              | 0.0543                       | 0.123             |
| 24.738 | 0.000 | 10.218 | 6.393           | 975.20              | 0.0272                       | 0.114             |
| 36.100 | 0.000 | 14.546 | 9.248           | 1948.70             | 0.0136                       | 0.109             |
| 54.859 | 0.000 | 20.577 | 13.264          | 3893.94             | 0.0068                       | 0.106             |
| 86.178 | 0.000 | 29.054 | 18.924          | 7781.01             | 0.0034                       | 0.104             |
| 87.391 | 0.000 | 29.356 | 19.125          | 7944.28             | 0.0033                       | 0.104             |

NUMBER OF STEPS = 1301  
SURFACE LAYER (CENTER) LEVEL = 17.85 M ABOVE DISCHARGE PORT  
AVG DILUTION = 2930.34

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 7914.07

1  
ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 4 JETLAG 2000  
TITLE Jet4

INPUT PARAMETERS  
^^^^^^^^^^^^^^^^^^^^  
ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
^^^^^^^^^^^^^^^^^^^^  
EXIT DEPTH(m) S T(C) SIGMAT U(m/s)  
29.30 0.00 15.00 -0.84 5.305  
.....  
AMBIENT 0.00 35.00 14.00 26.21 0.100  
30.00 35.00 14.00 26.21 0.100

LENGTH & DILUTION SCALES  
^^^^^^^^^^^^^^^^^^^^  
Total Q ... 0.0150 (m3/s) Qj ... 1.50E-02 (m3/s)  
Port No. ... 1 Mj ... 7.96E-02 (m4/s2)  
Depth ... 29.3000 (m) Bj ... 3.88E-03 (m4/s3)  
Diameter ... 0.0600 (m) lQ ... 0.0532 (m)  
Uj ... 5.3052 (m/s) lM ... 2.8209 (m)

|          |     |               |       |     |            |
|----------|-----|---------------|-------|-----|------------|
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 3.8766 (m) |
| dp/pa    | ... | 0.02635       | lm    | ... | 2.4064 (m) |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 53.0516    |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 100.1878   |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0188     |
| Hor. ang | ... | 180.00        | lQ/lm | ... | 0.0221     |
| Fd       | ... | 42.60         | lm/lb | ... | 0.7277     |
| Uj/Ua    | ... | 53.05         | lm/lb | ... | 0.6207     |

Coflowing case:  
dmj ... 0.0781  
lm\* ... 2.7942  
Sm\* ... 52.0516

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 5.305             |
| -0.176   | 0.000    | 0.000    | 0.060                  | 1.98                | 13.5224                      | 2.631             |
| -0.530   | 0.000    | 0.003    | 0.121                  | 3.89                | 6.8605                       | 1.271             |
| -1.239   | 0.000    | 0.027    | 0.250                  | 7.70                | 3.4506                       | 0.589             |
| -2.623   | 0.000    | 0.269    | 0.509                  | 14.75               | 1.7988                       | 0.272             |
| -4.096   | 0.000    | 1.323    | 0.974                  | 29.29               | 0.9054                       | 0.147             |
| -4.364   | 0.000    | 2.323    | 1.671                  | 58.62               | 0.4522                       | 0.100             |
| -4.005   | 0.000    | 3.152    | 2.493                  | 117.18              | 0.2262                       | 0.090             |
| -2.452   | 0.000    | 4.587    | 3.365                  | 232.66              | 0.1139                       | 0.098             |
| 1.244    | 0.000    | 7.098    | 4.623                  | 464.95              | 0.0570                       | 0.104             |
| 7.681    | 0.000    | 10.582   | 6.500                  | 929.26              | 0.0285                       | 0.105             |
| 18.616   | 0.000    | 15.362   | 9.209                  | 1857.14             | 0.0143                       | 0.105             |
| 37.066   | 0.000    | 21.953   | 13.073                 | 3711.39             | 0.0071                       | 0.104             |
| 61.617   | 0.000    | 29.317   | 17.484                 | 6593.27             | 0.0040                       | 0.103             |

NUMBER OF STEPS = 1281  
SURFACE LAYER (CENTER) LEVEL = 18.35 M ABOVE DISCHARGE PORT  
AVG DILUTION = 2614.45

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 6585.55

1 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 5 JETLAG 2000  
TITLE Jet5

INPUT PARAMETERS  
AAAAAAAAAAAAAAAAAAAA  
ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
AAAAAAAAAAAAAAAAAAAA  
EXIT DEPTH(m) S T(C) SIGMAT U(m/s)  
29.30 0.00 15.00 -0.84 5.305  
.....  
AMBIENT 0.00 35.00 14.00 26.21 0.100  
30.00 35.00 14.00 26.21 0.100

LENGTH & DILUTION SCALES  
AAAAAAAAAAAAAAAAAAAA  
Total Q ... 0.0150 (m3/s) Qj ... 1.50E-02 (m3/s)  
Port No. ... 1 Mj ... 7.96E-02 (m4/s2)  
Depth ... 29.3000 (m) Bj ... 3.88E-03 (m4/s3)  
Diameter ... 0.0600 (m) lQ ... 0.0532 (m)  
Uj ... 5.3052 (m/s) lm ... 2.8209 (m)

|          |     |               |       |     |            |
|----------|-----|---------------|-------|-----|------------|
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 3.8766 (m) |
| dp/pa    | ... | 0.02635       | lm    | ... | 2.4064 (m) |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 53.0516    |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 100.1878   |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0188     |
| Hor. ang | ... | 0.00          | lQ/lm | ... | 0.0221     |
| Fd       | ... | 42.60         | lm/lb | ... | 0.7277     |
| Uj/Ua    | ... | 53.05         | lm/lb | ... | 0.6207     |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dmj | ... | 0.0781  |
| lm* | ... | 2.7942  |
| Sm* | ... | 52.0516 |

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 5.305             |
| 0.179    | 0.000    | 0.000    | 0.059                  | 1.98                | 13.5224                      | 2.730             |
| 0.540    | 0.000    | 0.002    | 0.114                  | 3.89                | 6.8579                       | 1.419             |
| 1.264    | 0.000    | 0.021    | 0.220                  | 7.71                | 3.4476                       | 0.762             |
| 2.692    | 0.000    | 0.145    | 0.410                  | 15.32               | 1.7316                       | 0.436             |
| 4.923    | 0.000    | 0.658    | 0.723                  | 30.57               | 0.8674                       | 0.280             |
| 7.234    | 0.000    | 1.595    | 1.200                  | 61.10               | 0.4338                       | 0.203             |
| 9.792    | 0.000    | 2.920    | 1.902                  | 122.13              | 0.2170                       | 0.161             |
| 13.065   | 0.000    | 4.707    | 2.916                  | 244.14              | 0.1085                       | 0.137             |
| 17.679   | 0.000    | 7.061    | 4.360                  | 487.98              | 0.0543                       | 0.123             |
| 24.738   | 0.000    | 10.218   | 6.393                  | 975.20              | 0.0272                       | 0.114             |
| 36.100   | 0.000    | 14.546   | 9.248                  | 1948.70             | 0.0136                       | 0.109             |
| 54.859   | 0.000    | 20.577   | 13.264                 | 3893.94             | 0.0068                       | 0.106             |
| 86.178   | 0.000    | 29.054   | 18.924                 | 7781.01             | 0.0034                       | 0.104             |
| 87.391   | 0.000    | 29.356   | 19.125                 | 7944.28             | 0.0033                       | 0.104             |

NUMBER OF STEPS = 1301

SURFACE LAYER (CENTER) LEVEL = 17.85 M ABOVE DISCHARGE PORT  
AVG DILUTION = 2930.34

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 7914.07

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 6 JETLAG 2000  
TITLE Jet6

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                          |   |                      |
|--------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS   | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT        | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR            | : | STANDARD             |
| TIME STEP CONTRL         | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS | : | 1500                 |
| PRINTOUT INTERVAL        | : | 100                  |

|                            |   |         |
|----------------------------|---|---------|
| MAX NUMBER OF ITERATIONS   | : | 5       |
| ITERATION ERROR BOUND      | : | 0.00100 |
| APPROX RATIO OF MASS/DMASS | : | 144.0   |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |    |     |                  |
|----------|-----|---------------|----|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj | ... | 3.88E-03 (m4/s3) |

|          |     |               |       |     |            |
|----------|-----|---------------|-------|-----|------------|
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m) |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 2.8209 (m) |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 3.8766 (m) |
| dp/pa    | ... | 0.02635       | lM    | ... | 2.4064 (m) |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 53.0516    |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 100.1878   |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0188     |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0221     |
| Fd       | ... | 42.60         | lm/lb | ... | 0.7277     |
| Uj/Ua    | ... | 53.05         | lM/lb | ... | 0.6207     |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dmj | ... | 0.0781  |
| lm* | ... | 2.7942  |
| Sm* | ... | 52.0516 |

| X      | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------|-------|--------|-----------------|---------------------|------------------------------|----------|
| (m)    | (m)   | (m)    | (m)             |                     |                              | (m/s)    |
| 0.000  | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 5.305    |
| -0.176 | 0.000 | 0.000  | 0.060           | 1.98                | 13.5224                      | 2.631    |
| -0.530 | 0.000 | 0.003  | 0.121           | 3.89                | 6.8605                       | 1.271    |
| -1.239 | 0.000 | 0.027  | 0.250           | 7.70                | 3.4506                       | 0.589    |
| -2.623 | 0.000 | 0.269  | 0.509           | 14.75               | 1.7988                       | 0.272    |
| -4.096 | 0.000 | 1.323  | 0.974           | 29.29               | 0.9054                       | 0.147    |
| -4.364 | 0.000 | 2.323  | 1.671           | 58.62               | 0.4522                       | 0.100    |
| -4.005 | 0.000 | 3.152  | 2.493           | 117.18              | 0.2262                       | 0.090    |
| -2.452 | 0.000 | 4.587  | 3.365           | 232.66              | 0.1139                       | 0.098    |
| 1.244  | 0.000 | 7.098  | 4.623           | 464.95              | 0.0570                       | 0.104    |
| 7.681  | 0.000 | 10.582 | 6.500           | 929.26              | 0.0285                       | 0.105    |
| 18.616 | 0.000 | 15.362 | 9.209           | 1857.14             | 0.0143                       | 0.105    |
| 37.066 | 0.000 | 21.953 | 13.073          | 3711.39             | 0.0071                       | 0.104    |
| 61.617 | 0.000 | 29.317 | 17.484          | 6593.27             | 0.0040                       | 0.103    |

NUMBER OF STEPS = 1281

SURFACE LAYER (CENTER) LEVEL = 18.35 M ABOVE DISCHARGE PORT

AVG DILUTION = 2614.45

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 6585.55

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

|          |      |             |
|----------|------|-------------|
| CASE NO. | 7    | JETLAG 2000 |
| TITLE    | Jet7 |             |

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |   |                      |
|----------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS     | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : | STANDARD             |
| TIME STEP CONTRL           | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : | 1500                 |
| PRINTOUT INTERVAL          | : | 100                  |
| MAX NUMBER OF ITERATIONS   | : | 5                    |
| ITERATION ERROR BOUND      | : | 0.00100              |
| APPROX RATIO OF MASS/DMASS | : | 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |    |     |                  |
|----------|-----|---------------|----|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj | ... | 7.96E-02 (m4/s2) |

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 3.88E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 2.8209 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 3.8766 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 2.4064 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 53.0516          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 100.1878         |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0188           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0221           |
| Fd       | ... | 42.60         | lm/lb | ... | 0.7277           |
| Uj/Ua    | ... | 53.05         | lM/lb | ... | 0.6207           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0781  |
| lm* | ... | 2.7942  |
| Sm* | ... | 52.0516 |

| X      | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------|-------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)    | (m)   | (m)    | (m)             |                     |                              |                   |
| 0.000  | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 5.305             |
| 0.179  | 0.000 | 0.000  | 0.059           | 1.98                | 13.5224                      | 2.730             |
| 0.540  | 0.000 | 0.002  | 0.114           | 3.89                | 6.8579                       | 1.419             |
| 1.264  | 0.000 | 0.021  | 0.220           | 7.71                | 3.4476                       | 0.762             |
| 2.692  | 0.000 | 0.145  | 0.410           | 15.32               | 1.7316                       | 0.436             |
| 4.923  | 0.000 | 0.658  | 0.723           | 30.57               | 0.8674                       | 0.280             |
| 7.234  | 0.000 | 1.595  | 1.200           | 61.10               | 0.4338                       | 0.203             |
| 9.792  | 0.000 | 2.920  | 1.902           | 122.13              | 0.2170                       | 0.161             |
| 13.065 | 0.000 | 4.707  | 2.916           | 244.14              | 0.1085                       | 0.137             |
| 17.679 | 0.000 | 7.061  | 4.360           | 487.98              | 0.0543                       | 0.123             |
| 24.738 | 0.000 | 10.218 | 6.393           | 975.20              | 0.0272                       | 0.114             |
| 36.100 | 0.000 | 14.546 | 9.248           | 1948.70             | 0.0136                       | 0.109             |
| 54.859 | 0.000 | 20.577 | 13.264          | 3893.94             | 0.0068                       | 0.106             |
| 86.178 | 0.000 | 29.054 | 18.924          | 7781.01             | 0.0034                       | 0.104             |
| 87.391 | 0.000 | 29.356 | 19.125          | 7944.28             | 0.0033                       | 0.104             |

NUMBER OF STEPS = 1301

SURFACE LAYER (CENTER) LEVEL = 17.85 M ABOVE DISCHARGE PORT

AVG DILUTION = 2930.34

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 7914.07

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

|          |      |             |
|----------|------|-------------|
| CASE NO. | 8    | JETLAG 2000 |
| TITLE    | Jet8 |             |

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |   |                      |
|----------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS     | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : | STANDARD             |
| TIME STEP CONTRL           | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : | 1500                 |
| PRINTOUT INTERVAL          | : | 100                  |
| MAX NUMBER OF ITERATIONS   | : | 5                    |
| ITERATION ERROR BOUND      | : | 0.00100              |
| APPROX RATIO OF MASS/DMASS | : | 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|         |     |               |    |     |                 |
|---------|-----|---------------|----|-----|-----------------|
| Total Q | ... | 0.0150 (m3/s) | Qj | ... | 1.50E-02 (m3/s) |
|---------|-----|---------------|----|-----|-----------------|

```

Port No. ... 1
Depth ... 29.3000 (m)
Diameter ... 0.0600 (m)
Uj ... 5.3052 (m/s)
Ua ... 0.1000 (m/s)
dp/pa ... 0.02635
po ... 0.99916(g/cc)
pa ... 1.02621(g/cc)
Ver. ang ... 0.00
Hor. ang ... 180.00
Fd ... 42.60
Uj/Ua ... 53.05

Mj ... 7.96E-02 (m4/s2)
Bj ... 3.88E-03 (m4/s3)
lQ ... 0.0532 (m)
lm ... 2.8209 (m)
lb ... 3.8766 (m)
lM ... 2.4064 (m)
Sm ... 53.0516
Sb ... 100.1878
lQ/lm ... 0.0188
lQ/lM ... 0.0221
lm/lb ... 0.7277
lM/lb ... 0.6207

Coflowing case:
dmj ... 0.0781
lm* ... 2.7942
Sm* ... 52.0516

```

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 5.305             |
| -0.176   | 0.000    | 0.000    | 0.060                  | 1.98                | 13.5224                      | 2.631             |
| -0.530   | 0.000    | 0.003    | 0.121                  | 3.89                | 6.8605                       | 1.271             |
| -1.239   | 0.000    | 0.027    | 0.250                  | 7.70                | 3.4506                       | 0.589             |
| -2.623   | 0.000    | 0.269    | 0.509                  | 14.75               | 1.7988                       | 0.272             |
| -4.096   | 0.000    | 1.323    | 0.974                  | 29.29               | 0.9054                       | 0.147             |
| -4.364   | 0.000    | 2.323    | 1.671                  | 58.62               | 0.4522                       | 0.100             |
| -4.005   | 0.000    | 3.152    | 2.493                  | 117.18              | 0.2262                       | 0.090             |
| -2.452   | 0.000    | 4.587    | 3.365                  | 232.66              | 0.1139                       | 0.098             |
| 1.244    | 0.000    | 7.098    | 4.623                  | 464.95              | 0.0570                       | 0.104             |
| 7.681    | 0.000    | 10.582   | 6.500                  | 929.26              | 0.0285                       | 0.105             |
| 18.616   | 0.000    | 15.362   | 9.209                  | 1857.14             | 0.0143                       | 0.105             |
| 37.066   | 0.000    | 21.953   | 13.073                 | 3711.39             | 0.0071                       | 0.104             |
| 61.617   | 0.000    | 29.317   | 17.484                 | 6593.27             | 0.0040                       | 0.103             |

NUMBER OF STEPS = 1281  
 SURFACE LAYER (CENTER) LEVEL = 18.35 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 2614.45

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 6585.55

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 CASE NO. 9 JETLAG 2000  
 TITLE Jet9

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^^^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^^^^^  
 Total Q ... 0.0150 (m3/s) Qj ... 1.50E-02 (m3/s)





^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 3.88E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 2.8209 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 3.8766 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 2.4064 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 53.0516          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 100.1878         |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0188           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0221           |
| Fd       | ... | 42.60         | lm/lb | ... | 0.7277           |
| Uj/Ua    | ... | 53.05         | lM/lb | ... | 0.6207           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dmj | ... | 0.0781  |
| lm* | ... | 2.7942  |
| Sm* | ... | 52.0516 |

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 5.305             |
| -0.176   | 0.000    | 0.000    | 0.060                  | 1.98                | 13.5224                      | 2.631             |
| -0.530   | 0.000    | 0.003    | 0.121                  | 3.89                | 6.8605                       | 1.271             |
| -1.239   | 0.000    | 0.027    | 0.250                  | 7.70                | 3.4506                       | 0.589             |
| -2.623   | 0.000    | 0.269    | 0.509                  | 14.75               | 1.7988                       | 0.272             |
| -4.096   | 0.000    | 1.323    | 0.974                  | 29.29               | 0.9054                       | 0.147             |
| -4.364   | 0.000    | 2.323    | 1.671                  | 58.62               | 0.4522                       | 0.100             |
| -4.005   | 0.000    | 3.152    | 2.493                  | 117.18              | 0.2262                       | 0.090             |
| -2.452   | 0.000    | 4.587    | 3.365                  | 232.66              | 0.1139                       | 0.098             |
| 1.244    | 0.000    | 7.098    | 4.623                  | 464.95              | 0.0570                       | 0.104             |
| 7.681    | 0.000    | 10.582   | 6.500                  | 929.26              | 0.0285                       | 0.105             |
| 18.616   | 0.000    | 15.362   | 9.209                  | 1857.14             | 0.0143                       | 0.105             |
| 37.066   | 0.000    | 21.953   | 13.073                 | 3711.39             | 0.0071                       | 0.104             |
| 61.617   | 0.000    | 29.317   | 17.484                 | 6593.27             | 0.0040                       | 0.103             |

NUMBER OF STEPS = 1281

SURFACE LAYER (CENTER) LEVEL = 18.35 M ABOVE DISCHARGE PORT  
AVG DILUTION = 2614.45

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 6585.55

### SIMULACIÓN 15

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 1 JETLAG 2000  
TITLE Jet1

INPUT PARAMETERS  
^^^^^^^^^^^^^^^^^^^^

|                            |   |                      |
|----------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS     | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : | STANDARD             |
| TIME STEP CONTRL           | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : | 1500                 |
| PRINTOUT INTERVAL          | : | 100                  |
| MAX NUMBER OF ITERATIONS   | : | 5                    |
| ITERATION ERROR BOUND      | : | 0.00100              |
| APPROX RATIO OF MASS/DMASS | : | 144.0                |

ENVIROMENTAL CONDITIONS  
^^^^^^^^^^^^^^^^^^^^

|            |      |       |        |        |
|------------|------|-------|--------|--------|
| DEPTH(m)   | S    | T(C)  | SIGMAT | U(m/s) |
| EXIT 29.30 | 0.00 | 15.00 | -0.84  | 7.074  |

```

.....
AMBIENT      0.00      35.00      14.00      26.21      0.100
              30.00      35.00      14.00      26.21      0.100

```

#### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

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Total Q ... 0.0200 (m3/s)      Qj ... 2.00E-02 (m3/s)
Port No. ... 1                Mj ... 1.41E-01 (m4/s2)
Depth ... 29.3000 (m)         Bj ... 5.17E-03 (m4/s3)
Diameter ... 0.0600 (m)       lQ ... 0.0532 (m)
Uj ... 7.0736 (m/s)          lm ... 3.7613 (m)
Ua ... 0.1000 (m/s)          lb ... 5.1688 (m)
dp/pa ... 0.02635            lM ... 3.2085 (m)
po ... 0.99916(g/cc)         Sm ... 70.7355
pa ... 1.02621(g/cc)         Sb ... 133.5837
Ver. ang ... 0.00            lQ/lm ... 0.0141
Hor. ang ... 90.00           lQ/lM ... 0.0166
Fd ... 56.80                 lm/lb ... 0.7277
Uj/Ua ... 70.74              lM/lb ... 0.6207

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| X      | Y      | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------|--------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)    | (m)    | (m)    | (m)             |                     |                              |                   |
| 0.000  | 0.000  | 0.000  | 0.030           | 1.00                | 27.0447                      | 7.074             |
| 0.001  | 0.177  | 0.000  | 0.059           | 1.98                | 13.5224                      | 3.574             |
| 0.011  | 0.537  | 0.001  | 0.117           | 3.88                | 6.8830                       | 1.801             |
| 0.061  | 1.264  | 0.013  | 0.232           | 7.67                | 3.4650                       | 0.908             |
| 0.229  | 2.395  | 0.080  | 0.457           | 15.26               | 1.7390                       | 0.465             |
| 0.646  | 3.762  | 0.309  | 0.874           | 30.43               | 0.8714                       | 0.253             |
| 1.509  | 5.149  | 0.865  | 1.535           | 60.74               | 0.4364                       | 0.164             |
| 3.252  | 6.537  | 2.071  | 2.401           | 121.29              | 0.2185                       | 0.134             |
| 6.426  | 7.810  | 4.298  | 3.526           | 242.37              | 0.1093                       | 0.124             |
| 11.411 | 8.809  | 7.513  | 5.124           | 484.51              | 0.0547                       | 0.117             |
| 19.258 | 9.594  | 11.845 | 7.411           | 968.43              | 0.0274                       | 0.112             |
| 31.952 | 10.228 | 17.674 | 10.658          | 1935.46             | 0.0137                       | 0.108             |
| 52.859 | 10.750 | 25.605 | 15.253          | 3867.86             | 0.0068                       | 0.106             |
| 64.028 | 10.924 | 29.342 | 17.460          | 5031.85             | 0.0053                       | 0.105             |

NUMBER OF STEPS = 1236

SURFACE LAYER (CENTER) LEVEL = 18.29 M ABOVE DISCHARGE PORT  
AVG DILUTION = 2059.91

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 5017.96

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

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.....
CASE NO.      2                      JETLAG 2000
TITLE        Jet2

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#### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

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ENTRAINMENT HYPOTHESIS : ASYMMETRIC
SHEAR ENTRAINMENT      : VARIABLE (0 - 0.085)
COFLOW FACTOR          : STANDARD
TIME STEP CONTRL       : VARIABLE ( > 0.985 )
MAX NUMBER OF TIME STEPS : 1500
PRINTOUT INTERVAL      : 100
MAX NUMBER OF ITERATIONS : 5
ITERATION ERROR BOUND   : 0.00100
APPROX RATIO OF MASS/DMASS : 144.0

```

#### ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

#### LENGTH & DILUTION SCALES

^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|              |               |           |                  |
|--------------|---------------|-----------|------------------|
| Total Q ...  | 0.0200 (m3/s) | Qj ...    | 2.00E-02 (m3/s)  |
| Port No. ... | 1             | Mj ...    | 1.41E-01 (m4/s2) |
| Depth ...    | 29.3000 (m)   | Bj ...    | 5.17E-03 (m4/s3) |
| Diameter ... | 0.0600 (m)    | lQ ...    | 0.0532 (m)       |
| Uj ...       | 7.0736 (m/s)  | lm ...    | 3.7613 (m)       |
| Ua ...       | 0.1000 (m/s)  | lb ...    | 5.1688 (m)       |
| dp/pa ...    | 0.02635       | lM ...    | 3.2085 (m)       |
| po ...       | 0.99916(g/cc) | Sm ...    | 70.7355          |
| pa ...       | 1.02621(g/cc) | Sb ...    | 133.5837         |
| Ver. ang ... | 0.00          | lQ/lm ... | 0.0141           |
| Hor. ang ... | 180.00        | lQ/lM ... | 0.0166           |
| Fd ...       | 56.80         | lm/lb ... | 0.7277           |
| Uj/Ua ...    | 70.74         | lM/lb ... | 0.6207           |

| X      | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------|-------|--------|-----------------|---------------------|------------------------------|----------|
| (m)    | (m)   | (m)    | (m)             |                     |                              | (m/s)    |
| 0.000  | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 7.074    |
| -0.176 | 0.000 | 0.000  | 0.060           | 1.98                | 13.5224                      | 3.524    |
| -0.531 | 0.000 | 0.001  | 0.120           | 3.89                | 6.8601                       | 1.719    |
| -1.242 | 0.000 | 0.015  | 0.246           | 7.70                | 3.4502                       | 0.813    |
| -2.648 | 0.000 | 0.141  | 0.518           | 15.30               | 1.7344                       | 0.363    |
| -4.949 | 0.000 | 1.130  | 1.006           | 29.23               | 0.9071                       | 0.184    |
| -5.846 | 0.000 | 2.605  | 1.804           | 58.51               | 0.4530                       | 0.114    |
| -5.672 | 0.000 | 3.747  | 2.857           | 117.06              | 0.2264                       | 0.091    |
| -4.463 | 0.000 | 5.158  | 3.959           | 232.50              | 0.1140                       | 0.094    |
| -0.788 | 0.000 | 7.930  | 5.375           | 464.51              | 0.0570                       | 0.102    |
| 6.078  | 0.000 | 12.009 | 7.507           | 928.45              | 0.0285                       | 0.105    |
| 17.784 | 0.000 | 17.593 | 10.614          | 1855.58             | 0.0143                       | 0.105    |
| 37.580 | 0.000 | 25.276 | 15.061          | 3708.30             | 0.0071                       | 0.104    |
| 49.507 | 0.000 | 29.321 | 17.450          | 4959.76             | 0.0053                       | 0.104    |

NUMBER OF STEPS = 1240

SURFACE LAYER (CENTER) LEVEL = 18.29 M ABOVE DISCHARGE PORT  
AVG DILUTION = 1995.66

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 4952.86

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 3 JETLAG 2000  
TITLE Jet3

INPUT PARAMETERS

^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|                            |                        |
|----------------------------|------------------------|
| ENTRAINMENT HYPOTHESIS     | : ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : STANDARD             |
| TIME STEP CONTRL           | : VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : 1500                 |
| PRINTOUT INTERVAL          | : 100                  |
| MAX NUMBER OF ITERATIONS   | : 5                    |
| ITERATION ERROR BOUND      | : 0.00100              |
| APPROX RATIO OF MASS/DMASS | : 144.0                |

ENVIROMENTAL CONDITIONS

^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES

^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|              |               |        |                  |
|--------------|---------------|--------|------------------|
| Total Q ...  | 0.0200 (m3/s) | Qj ... | 2.00E-02 (m3/s)  |
| Port No. ... | 1             | Mj ... | 1.41E-01 (m4/s2) |
| Depth ...    | 29.3000 (m)   | Bj ... | 5.17E-03 (m4/s3) |
| Diameter ... | 0.0600 (m)    | lQ ... | 0.0532 (m)       |

|          |     |               |       |     |            |
|----------|-----|---------------|-------|-----|------------|
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 3.7613 (m) |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 5.1688 (m) |
| dp/pa    | ... | 0.02635       | lM    | ... | 3.2085 (m) |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 70.7355    |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 133.5837   |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0141     |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0166     |
| Fd       | ... | 56.80         | lm/lb | ... | 0.7277     |
| Uj/Ua    | ... | 70.74         | lM/lb | ... | 0.6207     |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.1395  |
| lm* | ... | 3.7346  |
| Sm* | ... | 69.7355 |

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 7.074             |
| 0.179    | 0.000    | 0.000    | 0.059                  | 1.98                | 13.5224                      | 3.623             |
| 0.539    | 0.000    | 0.001    | 0.115                  | 3.89                | 6.8582                       | 1.867             |
| 1.261    | 0.000    | 0.012    | 0.223                  | 7.71                | 3.4479                       | 0.987             |
| 2.698    | 0.000    | 0.088    | 0.422                  | 15.32               | 1.7321                       | 0.547             |
| 5.336    | 0.000    | 0.511    | 0.765                  | 30.53               | 0.8685                       | 0.332             |
| 8.431    | 0.000    | 1.546    | 1.301                  | 61.01               | 0.4345                       | 0.229             |
| 11.625   | 0.000    | 3.081    | 2.102                  | 121.96              | 0.2173                       | 0.176             |
| 15.524   | 0.000    | 5.197    | 3.264                  | 243.82              | 0.1087                       | 0.146             |
| 20.799   | 0.000    | 7.993    | 4.927                  | 487.40              | 0.0544                       | 0.128             |
| 28.622   | 0.000    | 11.706   | 7.279                  | 974.13              | 0.0272                       | 0.117             |
| 40.994   | 0.000    | 16.754   | 10.584                 | 1946.64             | 0.0136                       | 0.111             |
| 61.249   | 0.000    | 23.746   | 15.228                 | 3889.87             | 0.0068                       | 0.107             |
| 79.716   | 0.000    | 29.321   | 18.947                 | 5933.74             | 0.0045                       | 0.105             |

NUMBER OF STEPS = 1259

SURFACE LAYER (CENTER) LEVEL = 17.93 M ABOVE DISCHARGE PORT

AVG DILUTION = 2226.35

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 5925.27

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 4 JETLAG 2000

TITLE Jet4

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |   |                      |
|----------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS     | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : | STANDARD             |
| TIME STEP CONTRL           | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : | 1500                 |
| PRINTOUT INTERVAL          | : | 100                  |
| MAX NUMBER OF ITERATIONS   | : | 5                    |
| ITERATION ERROR BOUND      | : | 0.00100              |
| APPROX RATIO OF MASS/DMASS | : | 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |    |     |                  |
|----------|-----|---------------|----|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj | ... | 5.17E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ | ... | 0.0532 (m)       |

|          |     |               |       |     |            |
|----------|-----|---------------|-------|-----|------------|
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 3.7613 (m) |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 5.1688 (m) |
| dp/pa    | ... | 0.02635       | lM    | ... | 3.2085 (m) |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 70.7355    |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 133.5837   |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0141     |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0166     |
| Fd       | ... | 56.80         | lm/lb | ... | 0.7277     |
| Uj/Ua    | ... | 70.74         | lM/lb | ... | 0.6207     |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.1395  |
| lm* | ... | 3.7346  |
| Sm* | ... | 69.7355 |

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 7.074             |
| -0.176   | 0.000    | 0.000    | 0.060                  | 1.98                | 13.5224                      | 3.524             |
| -0.531   | 0.000    | 0.001    | 0.120                  | 3.89                | 6.8601                       | 1.719             |
| -1.242   | 0.000    | 0.015    | 0.246                  | 7.70                | 3.4502                       | 0.813             |
| -2.648   | 0.000    | 0.141    | 0.518                  | 15.30               | 1.7344                       | 0.363             |
| -4.949   | 0.000    | 1.130    | 1.006                  | 29.23               | 0.9071                       | 0.184             |
| -5.846   | 0.000    | 2.605    | 1.804                  | 58.51               | 0.4530                       | 0.114             |
| -5.672   | 0.000    | 3.747    | 2.857                  | 117.06              | 0.2264                       | 0.091             |
| -4.463   | 0.000    | 5.158    | 3.959                  | 232.50              | 0.1140                       | 0.094             |
| -0.788   | 0.000    | 7.930    | 5.375                  | 464.51              | 0.0570                       | 0.102             |
| 6.078    | 0.000    | 12.009   | 7.507                  | 928.45              | 0.0285                       | 0.105             |
| 17.784   | 0.000    | 17.593   | 10.614                 | 1855.58             | 0.0143                       | 0.105             |
| 37.580   | 0.000    | 25.276   | 15.061                 | 3708.30             | 0.0071                       | 0.104             |
| 49.507   | 0.000    | 29.321   | 17.450                 | 4959.76             | 0.0053                       | 0.104             |

NUMBER OF STEPS = 1240

SURFACE LAYER (CENTER) LEVEL = 18.29 M ABOVE DISCHARGE PORT

AVG DILUTION = 1995.66

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 4952.86

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 5 JETLAG 2000

TITLE Jet5

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |   |                      |
|----------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS     | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : | STANDARD             |
| TIME STEP CONTRL           | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : | 1500                 |
| PRINTOUT INTERVAL          | : | 100                  |
| MAX NUMBER OF ITERATIONS   | : | 5                    |
| ITERATION ERROR BOUND      | : | 0.00100              |
| APPROX RATIO OF MASS/DMASS | : | 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |    |     |                  |
|----------|-----|---------------|----|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj | ... | 5.17E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ | ... | 0.0532 (m)       |

|          |     |               |       |     |            |
|----------|-----|---------------|-------|-----|------------|
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 3.7613 (m) |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 5.1688 (m) |
| dp/pa    | ... | 0.02635       | lM    | ... | 3.2085 (m) |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 70.7355    |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 133.5837   |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0141     |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0166     |
| Fd       | ... | 56.80         | lm/lb | ... | 0.7277     |
| Uj/Ua    | ... | 70.74         | lM/lb | ... | 0.6207     |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.1395  |
| lm* | ... | 3.7346  |
| Sm* | ... | 69.7355 |

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 7.074             |
| 0.179    | 0.000    | 0.000    | 0.059                  | 1.98                | 13.5224                      | 3.623             |
| 0.539    | 0.000    | 0.001    | 0.115                  | 3.89                | 6.8582                       | 1.867             |
| 1.261    | 0.000    | 0.012    | 0.223                  | 7.71                | 3.4479                       | 0.987             |
| 2.698    | 0.000    | 0.088    | 0.422                  | 15.32               | 1.7321                       | 0.547             |
| 5.336    | 0.000    | 0.511    | 0.765                  | 30.53               | 0.8685                       | 0.332             |
| 8.431    | 0.000    | 1.546    | 1.301                  | 61.01               | 0.4345                       | 0.229             |
| 11.625   | 0.000    | 3.081    | 2.102                  | 121.96              | 0.2173                       | 0.176             |
| 15.524   | 0.000    | 5.197    | 3.264                  | 243.82              | 0.1087                       | 0.146             |
| 20.799   | 0.000    | 7.993    | 4.927                  | 487.40              | 0.0544                       | 0.128             |
| 28.622   | 0.000    | 11.706   | 7.279                  | 974.13              | 0.0272                       | 0.117             |
| 40.994   | 0.000    | 16.754   | 10.584                 | 1946.64             | 0.0136                       | 0.111             |
| 61.249   | 0.000    | 23.746   | 15.228                 | 3889.87             | 0.0068                       | 0.107             |
| 79.716   | 0.000    | 29.321   | 18.947                 | 5933.74             | 0.0045                       | 0.105             |

NUMBER OF STEPS = 1259

SURFACE LAYER (CENTER) LEVEL = 17.93 M ABOVE DISCHARGE PORT

AVG DILUTION = 2226.35

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 5925.27

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 6 JETLAG 2000

TITLE Jet6

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |   |                      |
|----------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS     | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : | STANDARD             |
| TIME STEP CONTRL           | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : | 1500                 |
| PRINTOUT INTERVAL          | : | 100                  |
| MAX NUMBER OF ITERATIONS   | : | 5                    |
| ITERATION ERROR BOUND      | : | 0.00100              |
| APPROX RATIO OF MASS/DMASS | : | 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |    |     |                  |
|----------|-----|---------------|----|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj | ... | 5.17E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ | ... | 0.0532 (m)       |

|          |     |               |       |     |            |
|----------|-----|---------------|-------|-----|------------|
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 3.7613 (m) |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 5.1688 (m) |
| dp/pa    | ... | 0.02635       | lM    | ... | 3.2085 (m) |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 70.7355    |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 133.5837   |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0141     |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0166     |
| Fd       | ... | 56.80         | lm/lb | ... | 0.7277     |
| Uj/Ua    | ... | 70.74         | lM/lb | ... | 0.6207     |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.1395  |
| lm* | ... | 3.7346  |
| Sm* | ... | 69.7355 |

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 7.074             |
| -0.176   | 0.000    | 0.000    | 0.060                  | 1.98                | 13.5224                      | 3.524             |
| -0.531   | 0.000    | 0.001    | 0.120                  | 3.89                | 6.8601                       | 1.719             |
| -1.242   | 0.000    | 0.015    | 0.246                  | 7.70                | 3.4502                       | 0.813             |
| -2.648   | 0.000    | 0.141    | 0.518                  | 15.30               | 1.7344                       | 0.363             |
| -4.949   | 0.000    | 1.130    | 1.006                  | 29.23               | 0.9071                       | 0.184             |
| -5.846   | 0.000    | 2.605    | 1.804                  | 58.51               | 0.4530                       | 0.114             |
| -5.672   | 0.000    | 3.747    | 2.857                  | 117.06              | 0.2264                       | 0.091             |
| -4.463   | 0.000    | 5.158    | 3.959                  | 232.50              | 0.1140                       | 0.094             |
| -0.788   | 0.000    | 7.930    | 5.375                  | 464.51              | 0.0570                       | 0.102             |
| 6.078    | 0.000    | 12.009   | 7.507                  | 928.45              | 0.0285                       | 0.105             |
| 17.784   | 0.000    | 17.593   | 10.614                 | 1855.58             | 0.0143                       | 0.105             |
| 37.580   | 0.000    | 25.276   | 15.061                 | 3708.30             | 0.0071                       | 0.104             |
| 49.507   | 0.000    | 29.321   | 17.450                 | 4959.76             | 0.0053                       | 0.104             |

NUMBER OF STEPS = 1240

SURFACE LAYER (CENTER) LEVEL = 18.29 M ABOVE DISCHARGE PORT

AVG DILUTION = 1995.66

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 4952.86

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 7 JETLAG 2000  
TITLE Jet7

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |   |                      |
|----------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS     | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : | STANDARD             |
| TIME STEP CONTRL           | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : | 1500                 |
| PRINTOUT INTERVAL          | : | 100                  |
| MAX NUMBER OF ITERATIONS   | : | 5                    |
| ITERATION ERROR BOUND      | : | 0.00100              |
| APPROX RATIO OF MASS/DMASS | : | 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |    |     |                  |
|----------|-----|---------------|----|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj | ... | 5.17E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ | ... | 0.0532 (m)       |

|          |     |               |       |     |            |
|----------|-----|---------------|-------|-----|------------|
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 3.7613 (m) |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 5.1688 (m) |
| dp/pa    | ... | 0.02635       | lM    | ... | 3.2085 (m) |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 70.7355    |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 133.5837   |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0141     |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0166     |
| Fd       | ... | 56.80         | lm/lb | ... | 0.7277     |
| Uj/Ua    | ... | 70.74         | lM/lb | ... | 0.6207     |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.1395  |
| lm* | ... | 3.7346  |
| Sm* | ... | 69.7355 |

| X      | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------|-------|--------|-----------------|---------------------|------------------------------|----------|
| (m)    | (m)   | (m)    | (m)             |                     |                              | (m/s)    |
| 0.000  | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 7.074    |
| 0.179  | 0.000 | 0.000  | 0.059           | 1.98                | 13.5224                      | 3.623    |
| 0.539  | 0.000 | 0.001  | 0.115           | 3.89                | 6.8582                       | 1.867    |
| 1.261  | 0.000 | 0.012  | 0.223           | 7.71                | 3.4479                       | 0.987    |
| 2.698  | 0.000 | 0.088  | 0.422           | 15.32               | 1.7321                       | 0.547    |
| 5.336  | 0.000 | 0.511  | 0.765           | 30.53               | 0.8685                       | 0.332    |
| 8.431  | 0.000 | 1.546  | 1.301           | 61.01               | 0.4345                       | 0.229    |
| 11.625 | 0.000 | 3.081  | 2.102           | 121.96              | 0.2173                       | 0.176    |
| 15.524 | 0.000 | 5.197  | 3.264           | 243.82              | 0.1087                       | 0.146    |
| 20.799 | 0.000 | 7.993  | 4.927           | 487.40              | 0.0544                       | 0.128    |
| 28.622 | 0.000 | 11.706 | 7.279           | 974.13              | 0.0272                       | 0.117    |
| 40.994 | 0.000 | 16.754 | 10.584          | 1946.64             | 0.0136                       | 0.111    |
| 61.249 | 0.000 | 23.746 | 15.228          | 3889.87             | 0.0068                       | 0.107    |
| 79.716 | 0.000 | 29.321 | 18.947          | 5933.74             | 0.0045                       | 0.105    |

NUMBER OF STEPS = 1259

SURFACE LAYER (CENTER) LEVEL = 17.93 M ABOVE DISCHARGE PORT  
AVG DILUTION = 2226.35

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 5925.27

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 8 JETLAG 2000  
TITLE Jet8

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |   |                      |
|----------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS     | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : | STANDARD             |
| TIME STEP CONTRL           | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : | 1500                 |
| PRINTOUT INTERVAL          | : | 100                  |
| MAX NUMBER OF ITERATIONS   | : | 5                    |
| ITERATION ERROR BOUND      | : | 0.00100              |
| APPROX RATIO OF MASS/DMASS | : | 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |    |     |                  |
|----------|-----|---------------|----|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj | ... | 5.17E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ | ... | 0.0532 (m)       |



|          |     |               |       |     |            |
|----------|-----|---------------|-------|-----|------------|
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 3.7613 (m) |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 5.1688 (m) |
| dp/pa    | ... | 0.02635       | lM    | ... | 3.2085 (m) |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 70.7355    |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 133.5837   |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0141     |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0166     |
| Fd       | ... | 56.80         | lm/lb | ... | 0.7277     |
| Uj/Ua    | ... | 70.74         | lM/lb | ... | 0.6207     |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.1395  |
| lm* | ... | 3.7346  |
| Sm* | ... | 69.7355 |

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 7.074             |
| -0.176   | 0.000    | 0.000    | 0.060                  | 1.98                | 13.5224                      | 3.524             |
| -0.531   | 0.000    | 0.001    | 0.120                  | 3.89                | 6.8601                       | 1.719             |
| -1.242   | 0.000    | 0.015    | 0.246                  | 7.70                | 3.4502                       | 0.813             |
| -2.648   | 0.000    | 0.141    | 0.518                  | 15.30               | 1.7344                       | 0.363             |
| -4.949   | 0.000    | 1.130    | 1.006                  | 29.23               | 0.9071                       | 0.184             |
| -5.846   | 0.000    | 2.605    | 1.804                  | 58.51               | 0.4530                       | 0.114             |
| -5.672   | 0.000    | 3.747    | 2.857                  | 117.06              | 0.2264                       | 0.091             |
| -4.463   | 0.000    | 5.158    | 3.959                  | 232.50              | 0.1140                       | 0.094             |
| -0.788   | 0.000    | 7.930    | 5.375                  | 464.51              | 0.0570                       | 0.102             |
| 6.078    | 0.000    | 12.009   | 7.507                  | 928.45              | 0.0285                       | 0.105             |
| 17.784   | 0.000    | 17.593   | 10.614                 | 1855.58             | 0.0143                       | 0.105             |
| 37.580   | 0.000    | 25.276   | 15.061                 | 3708.30             | 0.0071                       | 0.104             |
| 49.507   | 0.000    | 29.321   | 17.450                 | 4959.76             | 0.0053                       | 0.104             |

NUMBER OF STEPS = 1240

SURFACE LAYER (CENTER) LEVEL = 18.29 M ABOVE DISCHARGE PORT

AVG DILUTION = 1995.66

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 4952.86

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 9 JETLAG 2000

TITLE Jet9

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |   |                      |
|----------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS     | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : | STANDARD             |
| TIME STEP CONTRL           | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : | 1500                 |
| PRINTOUT INTERVAL          | : | 100                  |
| MAX NUMBER OF ITERATIONS   | : | 5                    |
| ITERATION ERROR BOUND      | : | 0.00100              |
| APPROX RATIO OF MASS/DMASS | : | 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |    |     |                  |
|----------|-----|---------------|----|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj | ... | 5.17E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ | ... | 0.0532 (m)       |

|          |     |               |       |     |            |
|----------|-----|---------------|-------|-----|------------|
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 3.7613 (m) |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 5.1688 (m) |
| dp/pa    | ... | 0.02635       | lm    | ... | 3.2085 (m) |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 70.7355    |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 133.5837   |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0141     |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0166     |
| Fd       | ... | 56.80         | lm/lb | ... | 0.7277     |
| Uj/Ua    | ... | 70.74         | lM/lb | ... | 0.6207     |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.1395  |
| lm* | ... | 3.7346  |
| Sm* | ... | 69.7355 |

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 7.074             |
| 0.179    | 0.000    | 0.000    | 0.059                  | 1.98                | 13.5224                      | 3.623             |
| 0.539    | 0.000    | 0.001    | 0.115                  | 3.89                | 6.8582                       | 1.867             |
| 1.261    | 0.000    | 0.012    | 0.223                  | 7.71                | 3.4479                       | 0.987             |
| 2.698    | 0.000    | 0.088    | 0.422                  | 15.32               | 1.7321                       | 0.547             |
| 5.336    | 0.000    | 0.511    | 0.765                  | 30.53               | 0.8685                       | 0.332             |
| 8.431    | 0.000    | 1.546    | 1.301                  | 61.01               | 0.4345                       | 0.229             |
| 11.625   | 0.000    | 3.081    | 2.102                  | 121.96              | 0.2173                       | 0.176             |
| 15.524   | 0.000    | 5.197    | 3.264                  | 243.82              | 0.1087                       | 0.146             |
| 20.799   | 0.000    | 7.993    | 4.927                  | 487.40              | 0.0544                       | 0.128             |
| 28.622   | 0.000    | 11.706   | 7.279                  | 974.13              | 0.0272                       | 0.117             |
| 40.994   | 0.000    | 16.754   | 10.584                 | 1946.64             | 0.0136                       | 0.111             |
| 61.249   | 0.000    | 23.746   | 15.228                 | 3889.87             | 0.0068                       | 0.107             |
| 79.716   | 0.000    | 29.321   | 18.947                 | 5933.74             | 0.0045                       | 0.105             |

NUMBER OF STEPS = 1259

SURFACE LAYER (CENTER) LEVEL = 17.93 M ABOVE DISCHARGE PORT

AVG DILUTION = 2226.35

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 5925.27

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

|          |       |             |
|----------|-------|-------------|
| CASE NO. | 10    | JETLAG 2000 |
| TITLE    | Jet10 |             |

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |                        |
|----------------------------|------------------------|
| ENTRAINMENT HYPOTHESIS     | : ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : STANDARD             |
| TIME STEP CONTRL           | : VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : 1500                 |
| PRINTOUT INTERVAL          | : 100                  |
| MAX NUMBER OF ITERATIONS   | : 5                    |
| ITERATION ERROR BOUND      | : 0.00100              |
| APPROX RATIO OF MASS/DMASS | : 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |    |     |                  |
|----------|-----|---------------|----|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj | ... | 5.17E-03 (m4/s3) |

|                 |     |         |
|-----------------|-----|---------|
| Coflowing case: |     |         |
| dMj             | ... | 0.1395  |
| Im*             | ... | 3.7346  |
| Sm*             | ... | 69.7355 |

NUMBER OF STEPS = 1240  
SURFACE LAYER (CENTER) LEVEL = 18.29 M ABOVE DISCHARGE PORT  
AVG DILUTION = 1995.66

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 4952.86

1  
ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
.....  
CASE NO. 1 JETLAG 2000  
TITLE Jet1

## LENGTH & DILUTION SCALES

^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|              |               |           |                  |
|--------------|---------------|-----------|------------------|
| Total Q ...  | 0.0100 (m3/s) | Qj ...    | 1.00E-02 (m3/s)  |
| Port No. ... | 1             | Mj ...    | 3.54E-02 (m4/s2) |
| Depth ...    | 29.3000 (m)   | Bj ...    | 2.58E-03 (m4/s3) |
| Diameter ... | 0.0600 (m)    | lQ ...    | 0.0532 (m)       |
| Uj ...       | 3.5368 (m/s)  | lm ...    | 0.9403 (m)       |
| Ua ...       | 0.2000 (m/s)  | lb ...    | 0.3231 (m)       |
| dp/pa ...    | 0.02635       | lM ...    | 1.6043 (m)       |
| po ...       | 0.99916(g/cc) | Sm ...    | 17.6839          |
| pa ...       | 1.02621(g/cc) | Sb ...    | 2.0872           |
| Ver. ang ... | 0.00          | lQ/lm ... | 0.0565           |
| Hor. ang ... | 90.00         | lQ/lM ... | 0.0331           |
| Fd ...       | 28.40         | lm/lb ... | 2.9107           |
| Uj/Ua ...    | 17.68         | lM/lb ... | 4.9660           |

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|---------|-------|--------|-----------------|---------------------|------------------------------|----------|
| (m)     | (m)   | (m)    | (m)             |                     |                              | (m/s)    |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 3.537    |
| 0.005   | 0.182 | 0.000  | 0.059           | 1.98                | 13.5224                      | 1.789    |
| 0.036   | 0.467 | 0.004  | 0.117           | 3.90                | 6.8477                       | 0.908    |
| 0.129   | 0.816 | 0.018  | 0.226           | 7.74                | 3.4356                       | 0.482    |
| 0.336   | 1.170 | 0.053  | 0.408           | 15.41               | 1.7221                       | 0.294    |
| 0.736   | 1.495 | 0.123  | 0.657           | 30.71               | 0.8634                       | 0.226    |
| 1.742   | 1.889 | 0.309  | 0.967           | 61.17               | 0.4333                       | 0.208    |
| 4.021   | 2.341 | 0.785  | 1.377           | 122.09              | 0.2171                       | 0.205    |
| 7.977   | 2.735 | 1.641  | 1.951           | 243.96              | 0.1086                       | 0.204    |
| 14.381  | 3.053 | 2.925  | 2.763           | 487.56              | 0.0543                       | 0.203    |
| 24.862  | 3.313 | 4.759  | 3.914           | 974.33              | 0.0272                       | 0.202    |
| 42.240  | 3.528 | 7.352  | 5.542           | 1947.04             | 0.0136                       | 0.202    |
| 71.260  | 3.708 | 11.008 | 7.844           | 3890.75             | 0.0068                       | 0.201    |
| 119.883 | 3.859 | 16.162 | 11.098          | 7774.80             | 0.0034                       | 0.201    |
| 201.485 | 3.985 | 23.432 | 15.699          | 15536.08            | 0.0017                       | 0.201    |
| 277.950 | 4.054 | 29.372 | 19.463          | 23864.06            | 0.0011                       | 0.201    |

NUMBER OF STEPS = 1460

SURFACE LAYER (CENTER) LEVEL = 17.41 M ABOVE DISCHARGE PORT  
AVG DILUTION = 8918.68

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 23752.18

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

.....  
CASE NO. 2 JETLAG 2000  
TITLE Jet2

INPUT PARAMETERS

^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES

^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|              |               |        |                  |
|--------------|---------------|--------|------------------|
| Total Q ...  | 0.0100 (m3/s) | Qj ... | 1.00E-02 (m3/s)  |
| Port No. ... | 1             | Mj ... | 3.54E-02 (m4/s2) |

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.58E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 0.9403 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.3231 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 1.6043 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 17.6839          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 2.0872           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0565           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0331           |
| Fd       | ... | 28.40         | lm/lb | ... | 2.9107           |
| Uj/Ua    | ... | 17.68         | lM/lb | ... | 4.9660           |

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|---------|-------|--------|-----------------|---------------------|------------------------------|----------|
| (m)     | (m)   | (m)    | (m)             |                     |                              | (m/s)    |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 3.537    |
| -0.173  | 0.000 | 0.000  | 0.061           | 1.98                | 13.5224                      | 1.688    |
| -0.521  | 0.000 | 0.006  | 0.128           | 3.89                | 6.8716                       | 0.749    |
| -1.184  | 0.000 | 0.078  | 0.266           | 7.13                | 3.7278                       | 0.321    |
| -1.968  | 0.000 | 0.514  | 0.561           | 13.48               | 1.9683                       | 0.136    |
| -1.968  | 0.000 | 0.772  | 0.919           | 27.98               | 0.9477                       | 0.105    |
| -1.461  | 0.000 | 1.077  | 1.086           | 54.32               | 0.4879                       | 0.147    |
| 0.074   | 0.000 | 1.658  | 1.404           | 108.48              | 0.2443                       | 0.175    |
| 3.044   | 0.000 | 2.505  | 1.910           | 216.71              | 0.1223                       | 0.189    |
| 8.347   | 0.000 | 3.719  | 2.654           | 432.97              | 0.0612                       | 0.196    |
| 17.499  | 0.000 | 5.443  | 3.723           | 865.11              | 0.0306                       | 0.199    |
| 33.061  | 0.000 | 7.879  | 5.246           | 1728.68             | 0.0153                       | 0.200    |
| 59.353  | 0.000 | 11.317 | 7.408           | 3454.35             | 0.0077                       | 0.200    |
| 103.636 | 0.000 | 16.169 | 10.469          | 6902.69             | 0.0038                       | 0.200    |
| 178.127 | 0.000 | 23.017 | 14.800          | 13793.39            | 0.0019                       | 0.200    |
| 257.388 | 0.000 | 29.323 | 18.795          | 22239.29            | 0.0012                       | 0.200    |

NUMBER OF STEPS = 1467

SURFACE LAYER (CENTER) LEVEL = 17.80 M ABOVE DISCHARGE PORT

AVG DILUTION = 8328.89

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 22204.40

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 3 JETLAG 2000  
TITLE Jet3

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |    |     |                  |
|----------|-----|---------------|----|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj | ... | 2.58E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm | ... | 0.9403 (m)       |

|          |     |               |       |     |            |
|----------|-----|---------------|-------|-----|------------|
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.3231 (m) |
| dp/pa    | ... | 0.02635       | lm    | ... | 1.6043 (m) |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 17.6839    |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 2.0872     |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0565     |
| Hor. ang | ... | 0.00          | lQ/lm | ... | 0.0331     |
| Fd       | ... | 28.40         | lm/lb | ... | 2.9107     |
| Uj/Ua    | ... | 17.68         | lm/lb | ... | 4.9660     |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dmj | ... | 0.0334  |
| lm* | ... | 0.9133  |
| Sm* | ... | 16.6839 |

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 3.537             |
| 0.183    | 0.000    | 0.000    | 0.058                  | 1.98                | 13.5224                      | 1.885             |
| 0.552    | 0.000    | 0.005    | 0.109                  | 3.90                | 6.8556                       | 1.046             |
| 1.296    | 0.000    | 0.038    | 0.198                  | 7.72                | 3.4452                       | 0.625             |
| 2.562    | 0.000    | 0.182    | 0.342                  | 15.36               | 1.7270                       | 0.417             |
| 4.019    | 0.000    | 0.460    | 0.558                  | 30.68               | 0.8643                       | 0.313             |
| 5.748    | 0.000    | 0.856    | 0.866                  | 61.29               | 0.4324                       | 0.260             |
| 8.183    | 0.000    | 1.418    | 1.296                  | 122.43              | 0.2164                       | 0.232             |
| 11.978   | 0.000    | 2.230    | 1.891                  | 244.60              | 0.1083                       | 0.218             |
| 18.133   | 0.000    | 3.403    | 2.722                  | 488.72              | 0.0542                       | 0.210             |
| 28.317   | 0.000    | 5.089    | 3.887                  | 976.49              | 0.0271                       | 0.206             |
| 45.327   | 0.000    | 7.506    | 5.526                  | 1951.18             | 0.0136                       | 0.203             |
| 73.864   | 0.000    | 10.961   | 7.836                  | 3898.88             | 0.0068                       | 0.202             |
| 121.829  | 0.000    | 15.887   | 11.099                 | 7790.88             | 0.0034                       | 0.201             |
| 202.516  | 0.000    | 22.896   | 15.707                 | 15568.15            | 0.0017                       | 0.201             |
| 288.430  | 0.000    | 29.388   | 19.955                 | 25100.56            | 0.0011                       | 0.201             |

NUMBER OF STEPS = 1467

SURFACE LAYER (CENTER) LEVEL = 17.28 M ABOVE DISCHARGE PORT

AVG DILUTION = 9129.61

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 24956.47

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

|          |      |             |
|----------|------|-------------|
| CASE NO. | 4    | JETLAG 2000 |
| TITLE    | Jet4 |             |

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |                        |
|----------------------------|------------------------|
| ENTRAINMENT HYPOTHESIS     | : ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : STANDARD             |
| TIME STEP CONTRL           | : VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : 1500                 |
| PRINTOUT INTERVAL          | : 100                  |
| MAX NUMBER OF ITERATIONS   | : 5                    |
| ITERATION ERROR BOUND      | : 0.00100              |
| APPROX RATIO OF MASS/DMASS | : 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |    |     |                  |
|----------|-----|---------------|----|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj | ... | 2.58E-03 (m4/s3) |

|          |     |               |       |     |            |
|----------|-----|---------------|-------|-----|------------|
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m) |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 0.9403 (m) |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.3231 (m) |
| dp/pa    | ... | 0.02635       | lM    | ... | 1.6043 (m) |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 17.6839    |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 2.0872     |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0565     |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0331     |
| Fd       | ... | 28.40         | lm/lb | ... | 2.9107     |
| Uj/Ua    | ... | 17.68         | lM/lb | ... | 4.9660     |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0334  |
| lm* | ... | 0.9133  |
| Sm* | ... | 16.6839 |

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 3.537             |
| -0.173   | 0.000    | 0.000    | 0.061                  | 1.98                | 13.5224                      | 1.688             |
| -0.521   | 0.000    | 0.006    | 0.128                  | 3.89                | 6.8716                       | 0.749             |
| -1.184   | 0.000    | 0.078    | 0.266                  | 7.13                | 3.7278                       | 0.321             |
| -1.968   | 0.000    | 0.514    | 0.561                  | 13.48               | 1.9683                       | 0.136             |
| -1.968   | 0.000    | 0.772    | 0.919                  | 27.98               | 0.9477                       | 0.105             |
| -1.461   | 0.000    | 1.077    | 1.086                  | 54.32               | 0.4879                       | 0.147             |
| 0.074    | 0.000    | 1.658    | 1.404                  | 108.48              | 0.2443                       | 0.175             |
| 3.044    | 0.000    | 2.505    | 1.910                  | 216.71              | 0.1223                       | 0.189             |
| 8.347    | 0.000    | 3.719    | 2.654                  | 432.97              | 0.0612                       | 0.196             |
| 17.499   | 0.000    | 5.443    | 3.723                  | 865.11              | 0.0306                       | 0.199             |
| 33.061   | 0.000    | 7.879    | 5.246                  | 1728.68             | 0.0153                       | 0.200             |
| 59.353   | 0.000    | 11.317   | 7.408                  | 3454.35             | 0.0077                       | 0.200             |
| 103.636  | 0.000    | 16.169   | 10.469                 | 6902.69             | 0.0038                       | 0.200             |
| 178.127  | 0.000    | 23.017   | 14.800                 | 13793.39            | 0.0019                       | 0.200             |
| 257.388  | 0.000    | 29.323   | 18.795                 | 22239.29            | 0.0012                       | 0.200             |

NUMBER OF STEPS = 1467

SURFACE LAYER (CENTER) LEVEL = 17.80 M ABOVE DISCHARGE PORT

AVG DILUTION = 8328.89

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 22204.40

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

|          |      |             |
|----------|------|-------------|
| CASE NO. | 5    | JETLAG 2000 |
| TITLE    | Jet5 |             |

INPUT PARAMETERS

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|                            |                        |
|----------------------------|------------------------|
| ENTRAINMENT HYPOTHESIS     | : ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : STANDARD             |
| TIME STEP CONTRL           | : VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : 1500                 |
| PRINTOUT INTERVAL          | : 100                  |
| MAX NUMBER OF ITERATIONS   | : 5                    |
| ITERATION ERROR BOUND      | : 0.00100              |
| APPROX RATIO OF MASS/DMASS | : 144.0                |

ENVIROMENTAL CONDITIONS

^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES

^^^^^^^^^^^^^^^^^^^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.58E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 0.9403 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.3231 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 1.6043 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 17.6839          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 2.0872           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0565           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0331           |
| Fd       | ... | 28.40         | lm/lb | ... | 2.9107           |
| Uj/Ua    | ... | 17.68         | lM/lb | ... | 4.9660           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0334  |
| lm* | ... | 0.9133  |
| Sm* | ... | 16.6839 |

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF. | VELOCITY |
|---------|-------|--------|-----------------|---------------------|------------------|----------|
| (m)     | (m)   | (m)    | (m)             |                     | (sigmat)         | (m/s)    |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447          | 3.537    |
| 0.183   | 0.000 | 0.000  | 0.058           | 1.98                | 13.5224          | 1.885    |
| 0.552   | 0.000 | 0.005  | 0.109           | 3.90                | 6.8556           | 1.046    |
| 1.296   | 0.000 | 0.038  | 0.198           | 7.72                | 3.4452           | 0.625    |
| 2.562   | 0.000 | 0.182  | 0.342           | 15.36               | 1.7270           | 0.417    |
| 4.019   | 0.000 | 0.460  | 0.558           | 30.68               | 0.8643           | 0.313    |
| 5.748   | 0.000 | 0.856  | 0.866           | 61.29               | 0.4324           | 0.260    |
| 8.183   | 0.000 | 1.418  | 1.296           | 122.43              | 0.2164           | 0.232    |
| 11.978  | 0.000 | 2.230  | 1.891           | 244.60              | 0.1083           | 0.218    |
| 18.133  | 0.000 | 3.403  | 2.722           | 488.72              | 0.0542           | 0.210    |
| 28.317  | 0.000 | 5.089  | 3.887           | 976.49              | 0.0271           | 0.206    |
| 45.327  | 0.000 | 7.506  | 5.526           | 1951.18             | 0.0136           | 0.203    |
| 73.864  | 0.000 | 10.961 | 7.836           | 3898.88             | 0.0068           | 0.202    |
| 121.829 | 0.000 | 15.887 | 11.099          | 7790.88             | 0.0034           | 0.201    |
| 202.516 | 0.000 | 22.896 | 15.707          | 15568.15            | 0.0017           | 0.201    |
| 288.430 | 0.000 | 29.388 | 19.955          | 25100.56            | 0.0011           | 0.201    |

NUMBER OF STEPS = 1467

SURFACE LAYER (CENTER) LEVEL = 17.28 M ABOVE DISCHARGE PORT  
AVG DILUTION = 9129.61

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 24956.47

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 6 JETLAG 2000  
TITLE Jet6

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |   |                      |
|----------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS     | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : | STANDARD             |
| TIME STEP CONTRL           | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : | 1500                 |
| PRINTOUT INTERVAL          | : | 100                  |
| MAX NUMBER OF ITERATIONS   | : | 5                    |
| ITERATION ERROR BOUND      | : | 0.00100              |
| APPROX RATIO OF MASS/DMASS | : | 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |



# LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.58E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 0.9403 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.3231 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 1.6043 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 17.6839          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 2.0872           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0565           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0331           |
| Fd       | ... | 28.40         | lm/lb | ... | 2.9107           |
| Uj/Ua    | ... | 17.68         | lM/lb | ... | 4.9660           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0334  |
| lm* | ... | 0.9133  |
| Sm* | ... | 16.6839 |

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF. | VELOCITY |
|---------|-------|--------|-----------------|---------------------|------------------|----------|
| (m)     | (m)   | (m)    | (m)             |                     | (sigmat)         | (m/s)    |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447          | 3.537    |
| -0.173  | 0.000 | 0.000  | 0.061           | 1.98                | 13.5224          | 1.688    |
| -0.521  | 0.000 | 0.006  | 0.128           | 3.89                | 6.8716           | 0.749    |
| -1.184  | 0.000 | 0.078  | 0.266           | 7.13                | 3.7278           | 0.321    |
| -1.968  | 0.000 | 0.514  | 0.561           | 13.48               | 1.9683           | 0.136    |
| -1.968  | 0.000 | 0.772  | 0.919           | 27.98               | 0.9477           | 0.105    |
| -1.461  | 0.000 | 1.077  | 1.086           | 54.32               | 0.4879           | 0.147    |
| 0.074   | 0.000 | 1.658  | 1.404           | 108.48              | 0.2443           | 0.175    |
| 3.044   | 0.000 | 2.505  | 1.910           | 216.71              | 0.1223           | 0.189    |
| 8.347   | 0.000 | 3.719  | 2.654           | 432.97              | 0.0612           | 0.196    |
| 17.499  | 0.000 | 5.443  | 3.723           | 865.11              | 0.0306           | 0.199    |
| 33.061  | 0.000 | 7.879  | 5.246           | 1728.68             | 0.0153           | 0.200    |
| 59.353  | 0.000 | 11.317 | 7.408           | 3454.35             | 0.0077           | 0.200    |
| 103.636 | 0.000 | 16.169 | 10.469          | 6902.69             | 0.0038           | 0.200    |
| 178.127 | 0.000 | 23.017 | 14.800          | 13793.39            | 0.0019           | 0.200    |
| 257.388 | 0.000 | 29.323 | 18.795          | 22239.29            | 0.0012           | 0.200    |

NUMBER OF STEPS = 1467

SURFACE LAYER (CENTER) LEVEL = 17.80 M ABOVE DISCHARGE PORT

AVG DILUTION = 8328.89

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 22204.40

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 7 JETLAG 2000

TITLE Jet7

## INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAAAAAAAAAA

|                            |   |                      |
|----------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS     | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : | STANDARD             |
| TIME STEP CONTRL           | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : | 1500                 |
| PRINTOUT INTERVAL          | : | 100                  |
| MAX NUMBER OF ITERATIONS   | : | 5                    |
| ITERATION ERROR BOUND      | : | 0.00100              |
| APPROX RATIO OF MASS/DMASS | : | 144.0                |

## ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAAAAAAAAAA

|      | DEPTH(m) | S    | T(C)  | SIGMAT | U(m/s) |
|------|----------|------|-------|--------|--------|
| EXIT | 29.30    | 0.00 | 15.00 | -0.84  | 3.537  |

```

.....
AMBIENT      0.00      35.00      14.00      26.21      0.200
              30.00      35.00      14.00      26.21      0.200

```

#### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

```

Total Q ... 0.0100 (m3/s)      Qj ... 1.00E-02 (m3/s)
Port No. ... 1                Mj ... 3.54E-02 (m4/s2)
Depth ... 29.3000 (m)         Bj ... 2.58E-03 (m4/s3)
Diameter ... 0.0600 (m)       lQ ... 0.0532 (m)
Uj ... 3.5368 (m/s)           lm ... 0.9403 (m)
Ua ... 0.2000 (m/s)           lb ... 0.3231 (m)
dp/pa ... 0.02635            lM ... 1.6043 (m)
po ... 0.99916(g/cc)         Sm ... 17.6839
pa ... 1.02621(g/cc)         Sb ... 2.0872
Ver. ang ... 0.00             lQ/lm ... 0.0565
Hor. ang ... 0.00             lQ/lM ... 0.0331
Fd ... 28.40                  lm/lb ... 2.9107
Uj/Ua ... 17.68               lM/lb ... 4.9660

```

#### Coflowing case:

```

dMj ... 0.0334
lm* ... 0.9133
Sm* ... 16.6839

```

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 3.537             |
| 0.183    | 0.000    | 0.000    | 0.058                  | 1.98                | 13.5224                      | 1.885             |
| 0.552    | 0.000    | 0.005    | 0.109                  | 3.90                | 6.8556                       | 1.046             |
| 1.296    | 0.000    | 0.038    | 0.198                  | 7.72                | 3.4452                       | 0.625             |
| 2.562    | 0.000    | 0.182    | 0.342                  | 15.36               | 1.7270                       | 0.417             |
| 4.019    | 0.000    | 0.460    | 0.558                  | 30.68               | 0.8643                       | 0.313             |
| 5.748    | 0.000    | 0.856    | 0.866                  | 61.29               | 0.4324                       | 0.260             |
| 8.183    | 0.000    | 1.418    | 1.296                  | 122.43              | 0.2164                       | 0.232             |
| 11.978   | 0.000    | 2.230    | 1.891                  | 244.60              | 0.1083                       | 0.218             |
| 18.133   | 0.000    | 3.403    | 2.722                  | 488.72              | 0.0542                       | 0.210             |
| 28.317   | 0.000    | 5.089    | 3.887                  | 976.49              | 0.0271                       | 0.206             |
| 45.327   | 0.000    | 7.506    | 5.526                  | 1951.18             | 0.0136                       | 0.203             |
| 73.864   | 0.000    | 10.961   | 7.836                  | 3898.88             | 0.0068                       | 0.202             |
| 121.829  | 0.000    | 15.887   | 11.099                 | 7790.88             | 0.0034                       | 0.201             |
| 202.516  | 0.000    | 22.896   | 15.707                 | 15568.15            | 0.0017                       | 0.201             |
| 288.430  | 0.000    | 29.388   | 19.955                 | 25100.56            | 0.0011                       | 0.201             |

NUMBER OF STEPS = 1467

SURFACE LAYER (CENTER) LEVEL = 17.28 M ABOVE DISCHARGE PORT  
AVG DILUTION = 9129.61

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 24956.47

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 8 JETLAG 2000  
TITLE Jet8

#### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)

COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

#### ENVIROMENTAL CONDITIONS

```

AAAAAAAAAAAAAAAAAAAAAAAAAAAA
      DEPTH(m)      S      T(C)      SIGMAT      U(m/s)
EXIT      29.30      0.00      15.00      -0.84      3.537
.....
AMBIENT      0.00      35.00      14.00      26.21      0.200
              30.00      35.00      14.00      26.21      0.200

```

#### LENGTH & DILUTION SCALES

```

AAAAAAAAAAAAAAAAAAAAAAAAAAAA
Total Q ... 0.0100 (m3/s)      Qj ... 1.00E-02 (m3/s)
Port No. ... 1      Mj ... 3.54E-02 (m4/s2)
Depth ... 29.3000 (m)      Bj ... 2.58E-03 (m4/s3)
Diameter ... 0.0600 (m)      lQ ... 0.0532 (m)
Uj ... 3.5368 (m/s)      lm ... 0.9403 (m)
Ua ... 0.2000 (m/s)      lb ... 0.3231 (m)
dp/pa ... 0.02635      lM ... 1.6043 (m)
po ... 0.99916(g/cc)      sm ... 17.6839
pa ... 1.02621(g/cc)      sb ... 2.0872
Ver. ang ... 0.00      lQ/lm ... 0.0565
Hor. ang ... 180.00      lQ/lM ... 0.0331
Fd ... 28.40      lm/lb ... 2.9107
Uj/Ua ... 17.68      lM/lb ... 4.9660

```

#### Coflowing case:

```

dmj ... 0.0334
lm* ... 0.9133
sm* ... 16.6839

```

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 3.537             |
| -0.173   | 0.000    | 0.000    | 0.061                  | 1.98                | 13.5224                      | 1.688             |
| -0.521   | 0.000    | 0.006    | 0.128                  | 3.89                | 6.8716                       | 0.749             |
| -1.184   | 0.000    | 0.078    | 0.266                  | 7.13                | 3.7278                       | 0.321             |
| -1.968   | 0.000    | 0.514    | 0.561                  | 13.48               | 1.9683                       | 0.136             |
| -1.968   | 0.000    | 0.772    | 0.919                  | 27.98               | 0.9477                       | 0.105             |
| -1.461   | 0.000    | 1.077    | 1.086                  | 54.32               | 0.4879                       | 0.147             |
| 0.074    | 0.000    | 1.658    | 1.404                  | 108.48              | 0.2443                       | 0.175             |
| 3.044    | 0.000    | 2.505    | 1.910                  | 216.71              | 0.1223                       | 0.189             |
| 8.347    | 0.000    | 3.719    | 2.654                  | 432.97              | 0.0612                       | 0.196             |
| 17.499   | 0.000    | 5.443    | 3.723                  | 865.11              | 0.0306                       | 0.199             |
| 33.061   | 0.000    | 7.879    | 5.246                  | 1728.68             | 0.0153                       | 0.200             |
| 59.353   | 0.000    | 11.317   | 7.408                  | 3454.35             | 0.0077                       | 0.200             |
| 103.636  | 0.000    | 16.169   | 10.469                 | 6902.69             | 0.0038                       | 0.200             |
| 178.127  | 0.000    | 23.017   | 14.800                 | 13793.39            | 0.0019                       | 0.200             |
| 257.388  | 0.000    | 29.323   | 18.795                 | 22239.29            | 0.0012                       | 0.200             |

NUMBER OF STEPS = 1467

SURFACE LAYER (CENTER) LEVEL = 17.80 M ABOVE DISCHARGE PORT

AVG DILUTION = 8328.89

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 22204.40

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

```

CASE NO.      9      JETLAG 2000
TITLE      Jet9

```

#### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAAAAAAAAAA

```

ENTRAINMENT HYPOTHESIS : ASYMMETRIC
SHEAR ENTRAINMENT      : VARIABLE (0 - 0.085)
COFLOW FACTOR          : STANDARD
TIME STEP CONTRL       : VARIABLE ( > 0.985 )
MAX NUMBER OF TIME STEPS : 1500
PRINTOUT INTERVAL      : 100
MAX NUMBER OF ITERATIONS : 5
ITERATION ERROR BOUND   : 0.00100
APPROX RATIO OF MASS/DMASS : 144.0

```

# ENVIROMENTAL CONDITIONS

^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|         |          |       |       |        |        |
|---------|----------|-------|-------|--------|--------|
| EXIT    | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|         | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| .....   | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
| AMBIENT | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

# LENGTH & DILUTION SCALES

^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.58E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 0.9403 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.3231 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 1.6043 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 17.6839          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 2.0872           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0565           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0331           |
| Fd       | ... | 28.40         | lm/lb | ... | 2.9107           |
| Uj/Ua    | ... | 17.68         | lM/lb | ... | 4.9660           |

## Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0334  |
| lm* | ... | 0.9133  |
| Sm* | ... | 16.6839 |

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|---------|-------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)     | (m)   | (m)    | (m)             |                     |                              |                   |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 3.537             |
| 0.183   | 0.000 | 0.000  | 0.058           | 1.98                | 13.5224                      | 1.885             |
| 0.552   | 0.000 | 0.005  | 0.109           | 3.90                | 6.8556                       | 1.046             |
| 1.296   | 0.000 | 0.038  | 0.198           | 7.72                | 3.4452                       | 0.625             |
| 2.562   | 0.000 | 0.182  | 0.342           | 15.36               | 1.7270                       | 0.417             |
| 4.019   | 0.000 | 0.460  | 0.558           | 30.68               | 0.8643                       | 0.313             |
| 5.748   | 0.000 | 0.856  | 0.866           | 61.29               | 0.4324                       | 0.260             |
| 8.183   | 0.000 | 1.418  | 1.296           | 122.43              | 0.2164                       | 0.232             |
| 11.978  | 0.000 | 2.230  | 1.891           | 244.60              | 0.1083                       | 0.218             |
| 18.133  | 0.000 | 3.403  | 2.722           | 488.72              | 0.0542                       | 0.210             |
| 28.317  | 0.000 | 5.089  | 3.887           | 976.49              | 0.0271                       | 0.206             |
| 45.327  | 0.000 | 7.506  | 5.526           | 1951.18             | 0.0136                       | 0.203             |
| 73.864  | 0.000 | 10.961 | 7.836           | 3898.88             | 0.0068                       | 0.202             |
| 121.829 | 0.000 | 15.887 | 11.099          | 7790.88             | 0.0034                       | 0.201             |
| 202.516 | 0.000 | 22.896 | 15.707          | 15568.15            | 0.0017                       | 0.201             |
| 288.430 | 0.000 | 29.388 | 19.955          | 25100.56            | 0.0011                       | 0.201             |

NUMBER OF STEPS = 1467

SURFACE LAYER (CENTER) LEVEL = 17.28 M ABOVE DISCHARGE PORT  
AVG DILUTION = 9129.61

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 24956.47

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

|          |       |             |
|----------|-------|-------------|
| CASE NO. | 10    | JETLAG 2000 |
| TITLE    | Jet10 |             |

## INPUT PARAMETERS

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|                          |   |                      |
|--------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS   | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT        | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR            | : | STANDARD             |
| TIME STEP CONTRL         | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS | : | 1500                 |
| PRINTOUT INTERVAL        | : | 100                  |
| MAX NUMBER OF ITERATIONS | : | 5                    |

ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES  
^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.58E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 0.9403 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.3231 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 1.6043 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 17.6839          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 2.0872           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0565           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0331           |
| Fd       | ... | 28.40         | lm/lb | ... | 2.9107           |
| Uj/Ua    | ... | 17.68         | lM/lb | ... | 4.9660           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dmj | ... | 0.0334  |
| lm* | ... | 0.9133  |
| Sm* | ... | 16.6839 |

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|---------|-------|--------|-----------------|---------------------|------------------------------|----------|
| (m)     | (m)   | (m)    | (m)             |                     |                              | (m/s)    |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 3.537    |
| -0.173  | 0.000 | 0.000  | 0.061           | 1.98                | 13.5224                      | 1.688    |
| -0.521  | 0.000 | 0.006  | 0.128           | 3.89                | 6.8716                       | 0.749    |
| -1.184  | 0.000 | 0.078  | 0.266           | 7.13                | 3.7278                       | 0.321    |
| -1.968  | 0.000 | 0.514  | 0.561           | 13.48               | 1.9683                       | 0.136    |
| -1.968  | 0.000 | 0.772  | 0.919           | 27.98               | 0.9477                       | 0.105    |
| -1.461  | 0.000 | 1.077  | 1.086           | 54.32               | 0.4879                       | 0.147    |
| 0.074   | 0.000 | 1.658  | 1.404           | 108.48              | 0.2443                       | 0.175    |
| 3.044   | 0.000 | 2.505  | 1.910           | 216.71              | 0.1223                       | 0.189    |
| 8.347   | 0.000 | 3.719  | 2.654           | 432.97              | 0.0612                       | 0.196    |
| 17.499  | 0.000 | 5.443  | 3.723           | 865.11              | 0.0306                       | 0.199    |
| 33.061  | 0.000 | 7.879  | 5.246           | 1728.68             | 0.0153                       | 0.200    |
| 59.353  | 0.000 | 11.317 | 7.408           | 3454.35             | 0.0077                       | 0.200    |
| 103.636 | 0.000 | 16.169 | 10.469          | 6902.69             | 0.0038                       | 0.200    |
| 178.127 | 0.000 | 23.017 | 14.800          | 13793.39            | 0.0019                       | 0.200    |
| 257.388 | 0.000 | 29.323 | 18.795          | 22239.29            | 0.0012                       | 0.200    |

NUMBER OF STEPS = 1467

SURFACE LAYER (CENTER) LEVEL = 17.80 M ABOVE DISCHARGE PORT  
AVG DILUTION = 8328.89

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 22204.40

# SIMULACIÓN 17

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 1 JETLAG 2000

TITLE Jet1

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^^^^^

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^^^^^

|         |          |       |       |        |        |
|---------|----------|-------|-------|--------|--------|
|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^^^^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 3.88E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| uj       | ... | 5.3052 (m/s)  | lm    | ... | 1.4105 (m)       |
| ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.4846 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 2.4064 (m)       |
| po       | ... | 0.99916(g/cc) | sm    | ... | 26.5258          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 3.1309           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0377           |
| Hor. ang | ... | 90.00         | lQ/lM | ... | 0.0221           |
| Fd       | ... | 42.60         | lm/lb | ... | 2.9107           |
| uj/ua    | ... | 26.53         | lM/lb | ... | 4.9660           |

|         |       |        |                 |                     |                              |          |
|---------|-------|--------|-----------------|---------------------|------------------------------|----------|
| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
| (m)     | (m)   | (m)    | (m)             |                     |                              | (m/s)    |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 5.305    |
| 0.003   | 0.183 | 0.000  | 0.059           | 1.97                | 13.5224                      | 2.696    |
| 0.028   | 0.521 | 0.002  | 0.117           | 3.88                | 6.8884                       | 1.359    |
| 0.113   | 0.999 | 0.013  | 0.229           | 7.69                | 3.4579                       | 0.699    |
| 0.320   | 1.531 | 0.046  | 0.434           | 15.31               | 1.7336                       | 0.388    |
| 0.738   | 2.048 | 0.118  | 0.750           | 30.53               | 0.8684                       | 0.260    |
| 1.605   | 2.563 | 0.271  | 1.156           | 60.85               | 0.4356                       | 0.217    |
| 3.806   | 3.213 | 0.699  | 1.673           | 121.32              | 0.2184                       | 0.207    |
| 8.178   | 3.868 | 1.642  | 2.376           | 242.33              | 0.1093                       | 0.205    |
| 15.399  | 4.410 | 3.173  | 3.367           | 484.32              | 0.0547                       | 0.204    |
| 27.108  | 4.849 | 5.405  | 4.771           | 967.91              | 0.0274                       | 0.203    |
| 46.382  | 5.210 | 8.573  | 6.758           | 1934.26             | 0.0137                       | 0.202    |
| 78.447  | 5.510 | 13.043 | 9.568           | 3865.29             | 0.0069                       | 0.202    |
| 132.081 | 5.761 | 19.345 | 13.541          | 7724.04             | 0.0034                       | 0.201    |
| 222.018 | 5.971 | 28.231 | 19.157          | 15434.76            | 0.0017                       | 0.201    |
| 235.060 | 5.992 | 29.408 | 19.902          | 16656.06            | 0.0016                       | 0.201    |

NUMBER OF STEPS = 1409

SURFACE LAYER (CENTER) LEVEL = 17.15 M ABOVE DISCHARGE PORT

AVG DILUTION = 6226.52

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 16541.84

1  
ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
.....  
CASE NO. 2 JETLAG 2000  
TITLE Jet2

INPUT PARAMETERS  
^^^^^^^^^^^^^^^^^^^^  
ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
^^^^^^^^^^^^^^^^^^^^  
EXIT DEPTH(m) S T(C) SIGMAT U(m/s)  
.....  
29.30 0.00 15.00 -0.84 5.305  
.....  
AMBIENT 0.00 35.00 14.00 26.21 0.200  
30.00 35.00 14.00 26.21 0.200

LENGTH & DILUTION SCALES  
^^^^^^^^^^^^^^^^^^^^  
Total Q ... 0.0150 (m3/s) Qj ... 1.50E-02 (m3/s)  
Port No. ... 1 Mj ... 7.96E-02 (m4/s2)  
Depth ... 29.3000 (m) Bj ... 3.88E-03 (m4/s3)  
Diameter ... 0.0600 (m) lQ ... 0.0532 (m)  
Uj ... 5.3052 (m/s) lm ... 1.4105 (m)  
ua ... 0.2000 (m/s) lb ... 0.4846 (m)  
dp/pa ... 0.02635 lm ... 2.4064 (m)  
po ... 0.99916(g/cc) Sm ... 26.5258  
pa ... 1.02621(g/cc) Sb ... 3.1309  
Ver. ang ... 0.00 lQ/lm ... 0.0377  
Hor. ang ... 180.00 lQ/lm ... 0.0221  
Fd ... 42.60 lm/lb ... 2.9107  
Uj/ua ... 26.53 lm/lb ... 4.9660

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|---------|-------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)     | (m)   | (m)    | (m)             |                     |                              |                   |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 5.305             |
| -0.174  | 0.000 | 0.000  | 0.061           | 1.98                | 13.5224                      | 2.582             |
| -0.526  | 0.000 | 0.003  | 0.125           | 3.89                | 6.8619                       | 1.196             |
| -1.220  | 0.000 | 0.031  | 0.268           | 7.64                | 3.4786                       | 0.508             |
| -2.517  | 0.000 | 0.354  | 0.536           | 13.49               | 1.9671                       | 0.224             |
| -3.060  | 0.000 | 0.987  | 1.146           | 27.93               | 0.9493                       | 0.102             |
| -2.809  | 0.000 | 1.283  | 1.465           | 55.67               | 0.4761                       | 0.124             |
| -1.442  | 0.000 | 1.926  | 1.788           | 108.24              | 0.2448                       | 0.162             |
| 1.640   | 0.000 | 2.949  | 2.378           | 216.22              | 0.1226                       | 0.183             |
| 7.340   | 0.000 | 4.426  | 3.272           | 431.98              | 0.0613                       | 0.193             |
| 17.329  | 0.000 | 6.531  | 4.570           | 863.14              | 0.0307                       | 0.197             |
| 34.431  | 0.000 | 9.513  | 6.426           | 1724.70             | 0.0154                       | 0.199             |
| 63.410  | 0.000 | 13.724 | 9.066           | 3446.42             | 0.0077                       | 0.200             |
| 112.287 | 0.000 | 19.666 | 12.807          | 6886.89             | 0.0038                       | 0.200             |
| 194.555 | 0.000 | 28.052 | 18.104          | 13761.85            | 0.0019                       | 0.200             |
| 208.744 | 0.000 | 29.370 | 18.937          | 15057.83            | 0.0018                       | 0.200             |

NUMBER OF STEPS = 1411  
SURFACE LAYER (CENTER) LEVEL = 17.72 M ABOVE DISCHARGE PORT  
AVG DILUTION = 5629.22

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 14988.00

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 3 JETLAG 2000  
 TITLE Jet3

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^  

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj    | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 3.88E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | lm    | ... 1.4105 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.4846 (m)       |
| dp/pa    | ... 0.02635       | lM    | ... 2.4064 (m)       |
| po       | ... 0.99916(g/cc) | Sm    | ... 26.5258          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 3.1309           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0377           |
| Hor. ang | ... 0.00          | lQ/lM | ... 0.0221           |
| Fd       | ... 42.60         | lm/lb | ... 2.9107           |
| Uj/Ua    | ... 26.53         | lM/lb | ... 4.9660           |

Coflowing case:  
 dmj ... 0.0766  
 lm\* ... 1.3836  
 Sm\* ... 25.5258

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|---------|-------|--------|-----------------|---------------------|------------------------------|----------|
| (m)     | (m)   | (m)    | (m)             |                     |                              | (m/s)    |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 5.305    |
| 0.181   | 0.000 | 0.000  | 0.058           | 1.98                | 13.5224                      | 2.779    |
| 0.546   | 0.000 | 0.002  | 0.112           | 3.89                | 6.8567                       | 1.494    |
| 1.280   | 0.000 | 0.019  | 0.208           | 7.71                | 3.4464                       | 0.849    |
| 2.749   | 0.000 | 0.118  | 0.372           | 15.33               | 1.7306                       | 0.528    |
| 4.802   | 0.000 | 0.417  | 0.630           | 30.61               | 0.8662                       | 0.369    |
| 7.141   | 0.000 | 0.908  | 1.006           | 61.17               | 0.4333                       | 0.289    |
| 10.074  | 0.000 | 1.588  | 1.537           | 122.23              | 0.2168                       | 0.247    |
| 14.440  | 0.000 | 2.568  | 2.274           | 244.21              | 0.1085                       | 0.225    |
| 21.370  | 0.000 | 3.984  | 3.299           | 487.93              | 0.0543                       | 0.214    |
| 32.716  | 0.000 | 6.025  | 4.731           | 974.93              | 0.0272                       | 0.208    |
| 51.577  | 0.000 | 8.959  | 6.741           | 1948.05             | 0.0136                       | 0.205    |
| 83.147  | 0.000 | 13.160 | 9.573           | 3892.60             | 0.0068                       | 0.203    |
| 136.158 | 0.000 | 19.158 | 13.568          | 7778.37             | 0.0034                       | 0.202    |
| 225.297 | 0.000 | 27.702 | 19.210          | 15543.08            | 0.0017                       | 0.201    |
| 244.371 | 0.000 | 29.371 | 20.308          | 17363.60            | 0.0015                       | 0.201    |

NUMBER OF STEPS = 1414  
 SURFACE LAYER (CENTER) LEVEL = 17.10 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 6298.39



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COMPUTATIONS CEASE: PLUME HITS WATER SURFACE
AVG DILUTION AT WATER SURFACE = 17283.95
1
ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT
.....
CASE NO.      4                                           JETLAG 2000
TITLE      Jet4

INPUT PARAMETERS
AAAAAAAAAAAAAAAAAAAA
ENTRAINMENT HYPOTHESIS      : ASYMMETRIC
SHEAR ENTRAINMENT          : VARIABLE (0 - 0.085)
COFLOW FACTOR              : STANDARD
TIME STEP CONTRL           : VARIABLE ( > 0.985 )
MAX NUMBER OF TIME STEPS   : 1500
PRINTOUT INTERVAL         : 100
MAX NUMBER OF ITERATIONS   : 5
ITERATION ERROR BOUND      : 0.00100
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS
AAAAAAAAAAAAAAAAAAAA
      DEPTH(m)      S      T(C)      SIGMAT      U(m/s)
EXIT      29.30      0.00      15.00      -0.84      5.305
.....
AMBIENT    0.00      35.00      14.00      26.21      0.200
           30.00      35.00      14.00      26.21      0.200

LENGTH & DILUTION SCALES
AAAAAAAAAAAAAAAAAAAA
Total Q ... 0.0150 (m3/s)      Qj ... 1.50E-02 (m3/s)
Port No. ... 1      Mj ... 7.96E-02 (m4/s2)
Depth ... 29.3000 (m)      Bj ... 3.88E-03 (m4/s3)
Diameter ... 0.0600 (m)      lQ ... 0.0532 (m)
Uj ... 5.3052 (m/s)      lm ... 1.4105 (m)
Ua ... 0.2000 (m/s)      lb ... 0.4846 (m)
dp/pa ... 0.02635      lM ... 2.4064 (m)
po ... 0.99916(g/cc)      sm ... 26.5258
pa ... 1.02621(g/cc)      Sb ... 3.1309
Ver. ang ... 0.00      lQ/lm ... 0.0377
Hor. ang ... 180.00      lQ/lM ... 0.0221
Fd ... 42.60      lm/lb ... 2.9107
Uj/Ua ... 26.53      lM/lb ... 4.9660

Coflowing case:
dmj ... 0.0766
lm* ... 1.3836
sm* ... 25.5258

      X      Y      Z      PLUME      AVERAGE      DENSITY      VELOCITY
      (m)      (m)      (m)      RADIUS      DILUTION      DIFF.      (m/s)
      .....
      0.000      0.000      0.000      0.030      1.00      27.0447      5.305
      -0.174      0.000      0.000      0.061      1.98      13.5224      2.582
      -0.526      0.000      0.003      0.125      3.89      6.8619      1.196
      -1.220      0.000      0.031      0.268      7.64      3.4786      0.508
      -2.517      0.000      0.354      0.536      13.49      1.9671      0.224
      -3.060      0.000      0.987      1.146      27.93      0.9493      0.102
      -2.809      0.000      1.283      1.465      55.67      0.4761      0.124
      -1.442      0.000      1.926      1.788      108.24      0.2448      0.162
      1.640      0.000      2.949      2.378      216.22      0.1226      0.183
      7.340      0.000      4.426      3.272      431.98      0.0613      0.193
      17.329      0.000      6.531      4.570      863.14      0.0307      0.197
      34.431      0.000      9.513      6.426      1724.70      0.0154      0.199
      63.410      0.000      13.724      9.066      3446.42      0.0077      0.200
      112.287      0.000      19.666      12.807      6886.89      0.0038      0.200
      194.555      0.000      28.052      18.104      13761.85      0.0019      0.200
      208.744      0.000      29.370      18.937      15057.83      0.0018      0.200

NUMBER OF STEPS = 1411

```

SURFACE LAYER (CENTER) LEVEL = 17.72 M ABOVE DISCHARGE PORT  
AVG DILUTION = 5629.22

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 14988.00

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 5 JETLAG 2000  
TITLE Jet5

INPUT PARAMETERS  
^^^^^^^^^^^^^^^^^^^^

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES  
^^^^^^^^^^^^^^^^^^^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 3.88E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 1.4105 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.4846 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 2.4064 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 26.5258          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 3.1309           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0377           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0221           |
| Fd       | ... | 42.60         | lm/lb | ... | 2.9107           |
| Uj/Ua    | ... | 26.53         | lM/lb | ... | 4.9660           |

Coflowing case:  
dMj ... 0.0766  
lm\* ... 1.3836  
Sm\* ... 25.5258

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|---------|-------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)     | (m)   | (m)    | (m)             |                     |                              |                   |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 5.305             |
| 0.181   | 0.000 | 0.000  | 0.058           | 1.98                | 13.5224                      | 2.779             |
| 0.546   | 0.000 | 0.002  | 0.112           | 3.89                | 6.8567                       | 1.494             |
| 1.280   | 0.000 | 0.019  | 0.208           | 7.71                | 3.4464                       | 0.849             |
| 2.749   | 0.000 | 0.118  | 0.372           | 15.33               | 1.7306                       | 0.528             |
| 4.802   | 0.000 | 0.417  | 0.630           | 30.61               | 0.8662                       | 0.369             |
| 7.141   | 0.000 | 0.908  | 1.006           | 61.17               | 0.4333                       | 0.289             |
| 10.074  | 0.000 | 1.588  | 1.537           | 122.23              | 0.2168                       | 0.247             |
| 14.440  | 0.000 | 2.568  | 2.274           | 244.21              | 0.1085                       | 0.225             |
| 21.370  | 0.000 | 3.984  | 3.299           | 487.93              | 0.0543                       | 0.214             |
| 32.716  | 0.000 | 6.025  | 4.731           | 974.93              | 0.0272                       | 0.208             |
| 51.577  | 0.000 | 8.959  | 6.741           | 1948.05             | 0.0136                       | 0.205             |
| 83.147  | 0.000 | 13.160 | 9.573           | 3892.60             | 0.0068                       | 0.203             |
| 136.158 | 0.000 | 19.158 | 13.568          | 7778.37             | 0.0034                       | 0.202             |
| 225.297 | 0.000 | 27.702 | 19.210          | 15543.08            | 0.0017                       | 0.201             |

244.371 0.000 29.371 20.308 17363.60 0.0015 0.201

NUMBER OF STEPS = 1414

SURFACE LAYER (CENTER) LEVEL = 17.10 M ABOVE DISCHARGE PORT  
AVG DILUTION = 6298.39

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 17283.95

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 6 JETLAG 2000  
TITLE Jet6

#### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

#### ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

#### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj    | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 3.88E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | lm    | ... 1.4105 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.4846 (m)       |
| dp/pa    | ... 0.02635       | lM    | ... 2.4064 (m)       |
| po       | ... 0.99916(g/cc) | Sm    | ... 26.5258          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 3.1309           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0377           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0221           |
| Fd       | ... 42.60         | lm/lb | ... 2.9107           |
| Uj/Ua    | ... 26.53         | lM/lb | ... 4.9660           |

Coflowing case:

|     |             |
|-----|-------------|
| dMj | ... 0.0766  |
| lm* | ... 1.3836  |
| Sm* | ... 25.5258 |

| X      | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)    | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000  | 0.000 | 0.000 | 0.030           | 1.00                | 27.0447                      | 5.305             |
| -0.174 | 0.000 | 0.000 | 0.061           | 1.98                | 13.5224                      | 2.582             |
| -0.526 | 0.000 | 0.003 | 0.125           | 3.89                | 6.8619                       | 1.196             |
| -1.220 | 0.000 | 0.031 | 0.268           | 7.64                | 3.4786                       | 0.508             |
| -2.517 | 0.000 | 0.354 | 0.536           | 13.49               | 1.9671                       | 0.224             |
| -3.060 | 0.000 | 0.987 | 1.146           | 27.93               | 0.9493                       | 0.102             |
| -2.809 | 0.000 | 1.283 | 1.465           | 55.67               | 0.4761                       | 0.124             |
| -1.442 | 0.000 | 1.926 | 1.788           | 108.24              | 0.2448                       | 0.162             |
| 1.640  | 0.000 | 2.949 | 2.378           | 216.22              | 0.1226                       | 0.183             |
| 7.340  | 0.000 | 4.426 | 3.272           | 431.98              | 0.0613                       | 0.193             |
| 17.329 | 0.000 | 6.531 | 4.570           | 863.14              | 0.0307                       | 0.197             |
| 34.431 | 0.000 | 9.513 | 6.426           | 1724.70             | 0.0154                       | 0.199             |

|         |       |        |        |          |        |       |
|---------|-------|--------|--------|----------|--------|-------|
| 63.410  | 0.000 | 13.724 | 9.066  | 3446.42  | 0.0077 | 0.200 |
| 112.287 | 0.000 | 19.666 | 12.807 | 6886.89  | 0.0038 | 0.200 |
| 194.555 | 0.000 | 28.052 | 18.104 | 13761.85 | 0.0019 | 0.200 |
| 208.744 | 0.000 | 29.370 | 18.937 | 15057.83 | 0.0018 | 0.200 |

NUMBER OF STEPS = 1411  
 SURFACE LAYER (CENTER) LEVEL = 17.72 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 5629.22

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 14988.00

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 7 JETLAG 2000  
 TITLE Jet7

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^^^^^  

|         |          |       |       |        |        |
|---------|----------|-------|-------|--------|--------|
|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^^^^^  

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 3.88E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| uj       | ... | 5.3052 (m/s)  | lm    | ... | 1.4105 (m)       |
| ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.4846 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 2.4064 (m)       |
| po       | ... | 0.99916(g/cc) | sm    | ... | 26.5258          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 3.1309           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0377           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0221           |
| Fd       | ... | 42.60         | lm/lb | ... | 2.9107           |
| uj/ua    | ... | 26.53         | lM/lb | ... | 4.9660           |

Coflowing case:  
 dmj ... 0.0766  
 lm\* ... 1.3836  
 sm\* ... 25.5258

| X      | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)    | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000  | 0.000 | 0.000 | 0.030           | 1.00                | 27.0447                      | 5.305             |
| 0.181  | 0.000 | 0.000 | 0.058           | 1.98                | 13.5224                      | 2.779             |
| 0.546  | 0.000 | 0.002 | 0.112           | 3.89                | 6.8567                       | 1.494             |
| 1.280  | 0.000 | 0.019 | 0.208           | 7.71                | 3.4464                       | 0.849             |
| 2.749  | 0.000 | 0.118 | 0.372           | 15.33               | 1.7306                       | 0.528             |
| 4.802  | 0.000 | 0.417 | 0.630           | 30.61               | 0.8662                       | 0.369             |
| 7.141  | 0.000 | 0.908 | 1.006           | 61.17               | 0.4333                       | 0.289             |
| 10.074 | 0.000 | 1.588 | 1.537           | 122.23              | 0.2168                       | 0.247             |
| 14.440 | 0.000 | 2.568 | 2.274           | 244.21              | 0.1085                       | 0.225             |
| 21.370 | 0.000 | 3.984 | 3.299           | 487.93              | 0.0543                       | 0.214             |

|         |       |        |        |          |        |       |
|---------|-------|--------|--------|----------|--------|-------|
| 32.716  | 0.000 | 6.025  | 4.731  | 974.93   | 0.0272 | 0.208 |
| 51.577  | 0.000 | 8.959  | 6.741  | 1948.05  | 0.0136 | 0.205 |
| 83.147  | 0.000 | 13.160 | 9.573  | 3892.60  | 0.0068 | 0.203 |
| 136.158 | 0.000 | 19.158 | 13.568 | 7778.37  | 0.0034 | 0.202 |
| 225.297 | 0.000 | 27.702 | 19.210 | 15543.08 | 0.0017 | 0.201 |
| 244.371 | 0.000 | 29.371 | 20.308 | 17363.60 | 0.0015 | 0.201 |

NUMBER OF STEPS = 1414  
 SURFACE LAYER (CENTER) LEVEL = 17.10 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 6298.39

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 17283.95

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 8 JETLAG 2000  
 TITLE Jet8

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^  

|         |          |       |       |        |        |
|---------|----------|-------|-------|--------|--------|
|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^  

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 3.88E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 1.4105 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.4846 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 2.4064 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 26.5258          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 3.1309           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0377           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0221           |
| Fd       | ... | 42.60         | lm/lb | ... | 2.9107           |
| Uj/Ua    | ... | 26.53         | lM/lb | ... | 4.9660           |

Coflowing case:  
 dMj ... 0.0766  
 lm\* ... 1.3836  
 Sm\* ... 25.5258

| X      | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)    | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000  | 0.000 | 0.000 | 0.030           | 1.00                | 27.0447                      | 5.305             |
| -0.174 | 0.000 | 0.000 | 0.061           | 1.98                | 13.5224                      | 2.582             |
| -0.526 | 0.000 | 0.003 | 0.125           | 3.89                | 6.8619                       | 1.196             |
| -1.220 | 0.000 | 0.031 | 0.268           | 7.64                | 3.4786                       | 0.508             |
| -2.517 | 0.000 | 0.354 | 0.536           | 13.49               | 1.9671                       | 0.224             |
| -3.060 | 0.000 | 0.987 | 1.146           | 27.93               | 0.9493                       | 0.102             |
| -2.809 | 0.000 | 1.283 | 1.465           | 55.67               | 0.4761                       | 0.124             |

|         |       |        |        |          |        |       |
|---------|-------|--------|--------|----------|--------|-------|
| -1.442  | 0.000 | 1.926  | 1.788  | 108.24   | 0.2448 | 0.162 |
| 1.640   | 0.000 | 2.949  | 2.378  | 216.22   | 0.1226 | 0.183 |
| 7.340   | 0.000 | 4.426  | 3.272  | 431.98   | 0.0613 | 0.193 |
| 17.329  | 0.000 | 6.531  | 4.570  | 863.14   | 0.0307 | 0.197 |
| 34.431  | 0.000 | 9.513  | 6.426  | 1724.70  | 0.0154 | 0.199 |
| 63.410  | 0.000 | 13.724 | 9.066  | 3446.42  | 0.0077 | 0.200 |
| 112.287 | 0.000 | 19.666 | 12.807 | 6886.89  | 0.0038 | 0.200 |
| 194.555 | 0.000 | 28.052 | 18.104 | 13761.85 | 0.0019 | 0.200 |
| 208.744 | 0.000 | 29.370 | 18.937 | 15057.83 | 0.0018 | 0.200 |

NUMBER OF STEPS = 1411

SURFACE LAYER (CENTER) LEVEL = 17.72 M ABOVE DISCHARGE PORT  
AVG DILUTION = 5629.22

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 14988.00

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

.....

CASE NO. 9 JETLAG 2000

TITLE Jet9

INPUT PARAMETERS

^^^^^^^^^^^^^^^^^^^^

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES

^^^^^^^^^^^^^^^^^^^^

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj    | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 3.88E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | lm    | ... 1.4105 (m)       |
| ua       | ... 0.2000 (m/s)  | lb    | ... 0.4846 (m)       |
| dp/pa    | ... 0.02635       | lm    | ... 2.4064 (m)       |
| po       | ... 0.99916(g/cc) | Sm    | ... 26.5258          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 3.1309           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0377           |
| Hor. ang | ... 0.00          | lQ/lM | ... 0.0221           |
| Fd       | ... 42.60         | lm/lb | ... 2.9107           |
| Uj/ua    | ... 26.53         | lm/lb | ... 4.9660           |

Coflowing case:

dMj ... 0.0766  
lm\* ... 1.3836  
Sm\* ... 25.5258

| X     | Y     | Z     | PLUME RADIUS | AVERAGE DILUTION | DENSITY DIFF. | VELOCITY |
|-------|-------|-------|--------------|------------------|---------------|----------|
| (m)   | (m)   | (m)   | (m)          |                  | (sigmat)      | (m/s)    |
| 0.000 | 0.000 | 0.000 | 0.030        | 1.00             | 27.0447       | 5.305    |
| 0.181 | 0.000 | 0.000 | 0.058        | 1.98             | 13.5224       | 2.779    |
| 0.546 | 0.000 | 0.002 | 0.112        | 3.89             | 6.8567        | 1.494    |
| 1.280 | 0.000 | 0.019 | 0.208        | 7.71             | 3.4464        | 0.849    |
| 2.749 | 0.000 | 0.118 | 0.372        | 15.33            | 1.7306        | 0.528    |

|         |       |        |        |          |        |       |
|---------|-------|--------|--------|----------|--------|-------|
| 4.802   | 0.000 | 0.417  | 0.630  | 30.61    | 0.8662 | 0.369 |
| 7.141   | 0.000 | 0.908  | 1.006  | 61.17    | 0.4333 | 0.289 |
| 10.074  | 0.000 | 1.588  | 1.537  | 122.23   | 0.2168 | 0.247 |
| 14.440  | 0.000 | 2.568  | 2.274  | 244.21   | 0.1085 | 0.225 |
| 21.370  | 0.000 | 3.984  | 3.299  | 487.93   | 0.0543 | 0.214 |
| 32.716  | 0.000 | 6.025  | 4.731  | 974.93   | 0.0272 | 0.208 |
| 51.577  | 0.000 | 8.959  | 6.741  | 1948.05  | 0.0136 | 0.205 |
| 83.147  | 0.000 | 13.160 | 9.573  | 3892.60  | 0.0068 | 0.203 |
| 136.158 | 0.000 | 19.158 | 13.568 | 7778.37  | 0.0034 | 0.202 |
| 225.297 | 0.000 | 27.702 | 19.210 | 15543.08 | 0.0017 | 0.201 |
| 244.371 | 0.000 | 29.371 | 20.308 | 17363.60 | 0.0015 | 0.201 |

NUMBER OF STEPS = 1414

SURFACE LAYER (CENTER) LEVEL = 17.10 M ABOVE DISCHARGE PORT

AVG DILUTION = 6298.39

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 17283.95

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

..... JETLAG 2000

CASE NO. 10

TITLE Jet10

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |                        |
|----------------------------|------------------------|
| ENTRAINMENT HYPOTHESIS     | : ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : STANDARD             |
| TIME STEP CONTRL           | : VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : 1500                 |
| PRINTOUT INTERVAL          | : 100                  |
| MAX NUMBER OF ITERATIONS   | : 5                    |
| ITERATION ERROR BOUND      | : 0.00100              |
| APPROX RATIO OF MASS/DMASS | : 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj    | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 3.88E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | lm    | ... 1.4105 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.4846 (m)       |
| dp/pa    | ... 0.02635       | lM    | ... 2.4064 (m)       |
| po       | ... 0.99916(g/cc) | Sm    | ... 26.5258          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 3.1309           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0377           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0221           |
| Fd       | ... 42.60         | lm/lb | ... 2.9107           |
| Uj/Ua    | ... 26.53         | lM/lb | ... 4.9660           |

Coflowing case:

|     |             |
|-----|-------------|
| dMj | ... 0.0766  |
| lm* | ... 1.3836  |
| Sm* | ... 25.5258 |

| X      | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------|-------|-------|-----------------|---------------------|------------------------------|-------------------|
| (m)    | (m)   | (m)   | (m)             |                     |                              |                   |
| 0.000  | 0.000 | 0.000 | 0.030           | 1.00                | 27.0447                      | 5.305             |
| -0.174 | 0.000 | 0.000 | 0.061           | 1.98                | 13.5224                      | 2.582             |
| -0.526 | 0.000 | 0.003 | 0.125           | 3.89                | 6.8619                       | 1.196             |

|         |       |        |        |          |        |       |
|---------|-------|--------|--------|----------|--------|-------|
| -1.220  | 0.000 | 0.031  | 0.268  | 7.64     | 3.4786 | 0.508 |
| -2.517  | 0.000 | 0.354  | 0.536  | 13.49    | 1.9671 | 0.224 |
| -3.060  | 0.000 | 0.987  | 1.146  | 27.93    | 0.9493 | 0.102 |
| -2.809  | 0.000 | 1.283  | 1.465  | 55.67    | 0.4761 | 0.124 |
| -1.442  | 0.000 | 1.926  | 1.788  | 108.24   | 0.2448 | 0.162 |
| 1.640   | 0.000 | 2.949  | 2.378  | 216.22   | 0.1226 | 0.183 |
| 7.340   | 0.000 | 4.426  | 3.272  | 431.98   | 0.0613 | 0.193 |
| 17.329  | 0.000 | 6.531  | 4.570  | 863.14   | 0.0307 | 0.197 |
| 34.431  | 0.000 | 9.513  | 6.426  | 1724.70  | 0.0154 | 0.199 |
| 63.410  | 0.000 | 13.724 | 9.066  | 3446.42  | 0.0077 | 0.200 |
| 112.287 | 0.000 | 19.666 | 12.807 | 6886.89  | 0.0038 | 0.200 |
| 194.555 | 0.000 | 28.052 | 18.104 | 13761.85 | 0.0019 | 0.200 |
| 208.744 | 0.000 | 29.370 | 18.937 | 15057.83 | 0.0018 | 0.200 |

NUMBER OF STEPS = 1411

SURFACE LAYER (CENTER) LEVEL = 17.72 M ABOVE DISCHARGE PORT  
AVG DILUTION = 5629.22

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 14988.00

### **SIMULACIÓN 18**

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 1 JETLAG 2000  
TITLE Jet1

#### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

#### ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

#### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0200 (m3/s) | Qj    | ... 2.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 1.41E-01 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 5.17E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 7.0736 (m/s)  | lm    | ... 1.8806 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.6461 (m)       |
| dp/pa    | ... 0.02635       | lM    | ... 3.2085 (m)       |
| po       | ... 0.99916(g/cc) | Sm    | ... 35.3678          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 4.1745           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0283           |
| Hor. ang | ... 90.00         | lQ/lM | ... 0.0166           |
| Fd       | ... 56.80         | lm/lb | ... 2.9107           |
| Uj/Ua    | ... 35.37         | lM/lb | ... 4.9660           |

| X     | Y     | Z     | PLUME RADIUS | AVERAGE DILUTION | DENSITY DIFF. | VELOCITY |
|-------|-------|-------|--------------|------------------|---------------|----------|
| (m)   | (m)   | (m)   | (m)          |                  | (sigmat)      | (m/s)    |
| 0.000 | 0.000 | 0.000 | 0.030        | 1.00             | 27.0447       | 7.074    |



|         |       |        |        |          |         |       |
|---------|-------|--------|--------|----------|---------|-------|
| 0.002   | 0.178 | 0.000  | 0.059  | 1.97     | 13.5224 | 3.588 |
| 0.022   | 0.542 | 0.001  | 0.117  | 3.87     | 6.8918  | 1.808 |
| 0.099   | 1.110 | 0.010  | 0.231  | 7.68     | 3.4610  | 0.920 |
| 0.302   | 1.805 | 0.039  | 0.446  | 15.29    | 1.7354  | 0.490 |
| 0.734   | 2.513 | 0.111  | 0.805  | 30.50    | 0.8694  | 0.300 |
| 1.563   | 3.179 | 0.255  | 1.299  | 60.84    | 0.4356  | 0.230 |
| 3.592   | 3.974 | 0.630  | 1.917  | 121.25   | 0.2186  | 0.210 |
| 8.137   | 4.877 | 1.581  | 2.736  | 242.06   | 0.1095  | 0.206 |
| 16.014  | 5.665 | 3.288  | 3.880  | 483.73   | 0.0548  | 0.205 |
| 28.757  | 6.303 | 5.845  | 5.500  | 966.79   | 0.0274  | 0.203 |
| 49.600  | 6.824 | 9.501  | 7.792  | 1932.08  | 0.0137  | 0.203 |
| 84.147  | 7.256 | 14.665 | 11.035 | 3860.98  | 0.0069  | 0.202 |
| 141.827 | 7.616 | 21.947 | 15.619 | 7715.45  | 0.0034  | 0.201 |
| 209.440 | 7.848 | 29.306 | 20.264 | 12967.36 | 0.0020  | 0.201 |

NUMBER OF STEPS = 1373  
 SURFACE LAYER (CENTER) LEVEL = 16.88 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 4890.11

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 12962.59

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 2 JETLAG 2000  
 TITLE Jet2

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^^^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^^^^^  

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.17E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.6461 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 3.2085 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 4.1745           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0166           |
| Fd       | ... | 56.80         | lm/lb | ... | 2.9107           |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 4.9660           |

| X      | Y     | Z     | PLUME RADIUS | AVERAGE DILUTION | DENSITY DIFF. | VELOCITY |
|--------|-------|-------|--------------|------------------|---------------|----------|
| (m)    | (m)   | (m)   | (m)          |                  | (sigmat)      | (m/s)    |
| 0.000  | 0.000 | 0.000 | 0.030        | 1.00             | 27.0447       | 7.074    |
| -0.175 | 0.000 | 0.000 | 0.060        | 1.98             | 13.5224       | 3.475    |
| -0.528 | 0.000 | 0.001 | 0.123        | 3.89             | 6.8612        | 1.644    |
| -1.234 | 0.000 | 0.016 | 0.259        | 7.69             | 3.4559        | 0.728    |
| -2.578 | 0.000 | 0.178 | 0.533        | 14.04            | 1.8905        | 0.315    |

|         |       |        |        |          |        |       |
|---------|-------|--------|--------|----------|--------|-------|
| -4.047  | 0.000 | 1.042  | 1.156  | 27.24    | 0.9736 | 0.130 |
| -4.008  | 0.000 | 1.523  | 1.824  | 55.85    | 0.4746 | 0.107 |
| -2.943  | 0.000 | 2.147  | 2.158  | 108.51   | 0.2442 | 0.148 |
| 0.156   | 0.000 | 3.312  | 2.800  | 216.75   | 0.1223 | 0.176 |
| 6.117   | 0.000 | 5.009  | 3.814  | 433.05   | 0.0612 | 0.190 |
| 16.736  | 0.000 | 7.438  | 5.302  | 865.25   | 0.0306 | 0.196 |
| 35.045  | 0.000 | 10.884 | 7.441  | 1728.90  | 0.0153 | 0.199 |
| 66.165  | 0.000 | 15.756 | 10.487 | 3454.76  | 0.0077 | 0.200 |
| 118.728 | 0.000 | 22.631 | 14.809 | 6903.59  | 0.0038 | 0.200 |
| 178.652 | 0.000 | 29.376 | 19.062 | 11443.34 | 0.0023 | 0.200 |

NUMBER OF STEPS = 1371  
 SURFACE LAYER (CENTER) LEVEL = 17.63 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 4279.10

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 11385.78

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 3 JETLAG 2000  
 TITLE Jet3

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^  

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0200 (m3/s) | Qj    | ... 2.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 1.41E-01 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 5.17E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 7.0736 (m/s)  | lm    | ... 1.8806 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.6461 (m)       |
| dp/pa    | ... 0.02635       | lM    | ... 3.2085 (m)       |
| po       | ... 0.99916(g/cc) | Sm    | ... 35.3678          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 4.1745           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0283           |
| Hor. ang | ... 0.00          | lQ/lM | ... 0.0166           |
| Fd       | ... 56.80         | lm/lb | ... 2.9107           |
| Uj/Ua    | ... 35.37         | lM/lb | ... 4.9660           |

Coflowing case:  
 dmj ... 0.1375  
 lm\* ... 1.8539  
 Sm\* ... 34.3678

| X     | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|-------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)   | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000 | 0.000 | 0.000 | 0.030           | 1.00                | 27.0447                      | 7.074    |
| 0.180 | 0.000 | 0.000 | 0.059           | 1.98                | 13.5224                      | 3.672    |
| 0.543 | 0.000 | 0.001 | 0.113           | 3.89                | 6.8573                       | 1.942    |
| 1.272 | 0.000 | 0.011 | 0.214           | 7.71                | 3.4470                       | 1.074    |

|         |       |        |        |          |        |       |
|---------|-------|--------|--------|----------|--------|-------|
| 2.735   | 0.000 | 0.074  | 0.391  | 15.33    | 1.7312 | 0.640 |
| 5.277   | 0.000 | 0.353  | 0.677  | 30.57    | 0.8674 | 0.424 |
| 8.232   | 0.000 | 0.904  | 1.108  | 61.08    | 0.4339 | 0.317 |
| 11.724  | 0.000 | 1.696  | 1.724  | 122.10   | 0.2170 | 0.262 |
| 16.601  | 0.000 | 2.814  | 2.581  | 243.95   | 0.1086 | 0.233 |
| 24.188  | 0.000 | 4.432  | 3.772  | 487.42   | 0.0544 | 0.218 |
| 36.477  | 0.000 | 6.769  | 5.432  | 973.91   | 0.0272 | 0.210 |
| 56.801  | 0.000 | 10.132 | 7.758  | 1946.01  | 0.0136 | 0.206 |
| 90.740  | 0.000 | 14.955 | 11.030 | 3888.47  | 0.0068 | 0.203 |
| 147.669 | 0.000 | 21.850 | 15.644 | 7770.03  | 0.0034 | 0.202 |
| 218.941 | 0.000 | 29.318 | 20.597 | 13425.61 | 0.0020 | 0.201 |

NUMBER OF STEPS = 1377

SURFACE LAYER (CENTER) LEVEL = 16.94 M ABOVE DISCHARGE PORT

AVG DILUTION = 4872.06

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 13409.97

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

.....

CASE NO. 4 JETLAG 2000

TITLE Jet4

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0200 (m3/s) | Qj    | ... 2.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 1.41E-01 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 5.17E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 7.0736 (m/s)  | lm    | ... 1.8806 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.6461 (m)       |
| dp/pa    | ... 0.02635       | lM    | ... 3.2085 (m)       |
| po       | ... 0.99916(g/cc) | Sm    | ... 35.3678          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 4.1745           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0283           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0166           |
| Fd       | ... 56.80         | lm/lb | ... 2.9107           |
| Uj/Ua    | ... 35.37         | lM/lb | ... 4.9660           |

Coflowing case:

dMj ... 0.1375  
 lm\* ... 1.8539  
 Sm\* ... 34.3678

| X      | Y     | Z     | PLUME RADIUS | AVERAGE DILUTION | DENSITY DIFF. (sigmat) | VELOCITY |
|--------|-------|-------|--------------|------------------|------------------------|----------|
| (m)    | (m)   | (m)   | (m)          |                  |                        | (m/s)    |
| 0.000  | 0.000 | 0.000 | 0.030        | 1.00             | 27.0447                | 7.074    |
| -0.175 | 0.000 | 0.000 | 0.060        | 1.98             | 13.5224                | 3.475    |
| -0.528 | 0.000 | 0.001 | 0.123        | 3.89             | 6.8612                 | 1.644    |

|         |       |        |        |          |        |       |
|---------|-------|--------|--------|----------|--------|-------|
| -1.234  | 0.000 | 0.016  | 0.259  | 7.69     | 3.4559 | 0.728 |
| -2.578  | 0.000 | 0.178  | 0.533  | 14.04    | 1.8905 | 0.315 |
| -4.047  | 0.000 | 1.042  | 1.156  | 27.24    | 0.9736 | 0.130 |
| -4.008  | 0.000 | 1.523  | 1.824  | 55.85    | 0.4746 | 0.107 |
| -2.943  | 0.000 | 2.147  | 2.158  | 108.51   | 0.2442 | 0.148 |
| 0.156   | 0.000 | 3.312  | 2.800  | 216.75   | 0.1223 | 0.176 |
| 6.117   | 0.000 | 5.009  | 3.814  | 433.05   | 0.0612 | 0.190 |
| 16.736  | 0.000 | 7.438  | 5.302  | 865.25   | 0.0306 | 0.196 |
| 35.045  | 0.000 | 10.884 | 7.441  | 1728.90  | 0.0153 | 0.199 |
| 66.165  | 0.000 | 15.756 | 10.487 | 3454.76  | 0.0077 | 0.200 |
| 118.728 | 0.000 | 22.631 | 14.809 | 6903.59  | 0.0038 | 0.200 |
| 178.652 | 0.000 | 29.376 | 19.062 | 11443.34 | 0.0023 | 0.200 |

NUMBER OF STEPS = 1371  
 SURFACE LAYER (CENTER) LEVEL = 17.63 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 4279.10

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 11385.78

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 5 JETLAG 2000  
 TITLE Jet5

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^  

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0200 (m3/s) | Qj    | ... 2.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 1.41E-01 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 5.17E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 7.0736 (m/s)  | lm    | ... 1.8806 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.6461 (m)       |
| dp/pa    | ... 0.02635       | lm    | ... 3.2085 (m)       |
| po       | ... 0.99916(g/cc) | Sm    | ... 35.3678          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 4.1745           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0283           |
| Hor. ang | ... 0.00          | lQ/lm | ... 0.0166           |
| Fd       | ... 56.80         | lm/lb | ... 2.9107           |
| Uj/Ua    | ... 35.37         | lm/lb | ... 4.9660           |

Coflowing case:  
 dmj ... 0.1375  
 lm\* ... 1.8539  
 sm\* ... 34.3678

| X     | Y     | Z     | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|-------|-------|-------|-----------------|---------------------|------------------------------|----------|
| (m)   | (m)   | (m)   | (m)             |                     |                              | (m/s)    |
| 0.000 | 0.000 | 0.000 | 0.030           | 1.00                | 27.0447                      | 7.074    |

|         |       |        |        |          |         |       |
|---------|-------|--------|--------|----------|---------|-------|
| 0.180   | 0.000 | 0.000  | 0.059  | 1.98     | 13.5224 | 3.672 |
| 0.543   | 0.000 | 0.001  | 0.113  | 3.89     | 6.8573  | 1.942 |
| 1.272   | 0.000 | 0.011  | 0.214  | 7.71     | 3.4470  | 1.074 |
| 2.735   | 0.000 | 0.074  | 0.391  | 15.33    | 1.7312  | 0.640 |
| 5.277   | 0.000 | 0.353  | 0.677  | 30.57    | 0.8674  | 0.424 |
| 8.232   | 0.000 | 0.904  | 1.108  | 61.08    | 0.4339  | 0.317 |
| 11.724  | 0.000 | 1.696  | 1.724  | 122.10   | 0.2170  | 0.262 |
| 16.601  | 0.000 | 2.814  | 2.581  | 243.95   | 0.1086  | 0.233 |
| 24.188  | 0.000 | 4.432  | 3.772  | 487.42   | 0.0544  | 0.218 |
| 36.477  | 0.000 | 6.769  | 5.432  | 973.91   | 0.0272  | 0.210 |
| 56.801  | 0.000 | 10.132 | 7.758  | 1946.01  | 0.0136  | 0.206 |
| 90.740  | 0.000 | 14.955 | 11.030 | 3888.47  | 0.0068  | 0.203 |
| 147.669 | 0.000 | 21.850 | 15.644 | 7770.03  | 0.0034  | 0.202 |
| 218.941 | 0.000 | 29.318 | 20.597 | 13425.61 | 0.0020  | 0.201 |

NUMBER OF STEPS = 1377  
 SURFACE LAYER (CENTER) LEVEL = 16.94 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 4872.06

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 13409.97

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 6 JETLAG 2000  
 TITLE Jet6

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^^^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^^^^^  

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0200 (m3/s) | Qj    | ... 2.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 1.41E-01 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 5.17E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 7.0736 (m/s)  | lm    | ... 1.8806 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.6461 (m)       |
| dp/pa    | ... 0.02635       | lm    | ... 3.2085 (m)       |
| po       | ... 0.99916(g/cc) | Sm    | ... 35.3678          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 4.1745           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0283           |
| Hor. ang | ... 180.00        | lQ/lm | ... 0.0166           |
| Fd       | ... 56.80         | lm/lb | ... 2.9107           |
| Uj/Ua    | ... 35.37         | lm/lb | ... 4.9660           |

Coflowing case:  
 dmj ... 0.1375  
 lm\* ... 1.8539  
 Sm\* ... 34.3678

| X   | Y   | Z   | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|-----|-----|-----|-----------------|---------------------|------------------------------|-------------------|
| (m) | (m) | (m) | (m)             |                     |                              |                   |

|         |       |        |        |          |         |       |
|---------|-------|--------|--------|----------|---------|-------|
| 0.000   | 0.000 | 0.000  | 0.030  | 1.00     | 27.0447 | 7.074 |
| -0.175  | 0.000 | 0.000  | 0.060  | 1.98     | 13.5224 | 3.475 |
| -0.528  | 0.000 | 0.001  | 0.123  | 3.89     | 6.8612  | 1.644 |
| -1.234  | 0.000 | 0.016  | 0.259  | 7.69     | 3.4559  | 0.728 |
| -2.578  | 0.000 | 0.178  | 0.533  | 14.04    | 1.8905  | 0.315 |
| -4.047  | 0.000 | 1.042  | 1.156  | 27.24    | 0.9736  | 0.130 |
| -4.008  | 0.000 | 1.523  | 1.824  | 55.85    | 0.4746  | 0.107 |
| -2.943  | 0.000 | 2.147  | 2.158  | 108.51   | 0.2442  | 0.148 |
| 0.156   | 0.000 | 3.312  | 2.800  | 216.75   | 0.1223  | 0.176 |
| 6.117   | 0.000 | 5.009  | 3.814  | 433.05   | 0.0612  | 0.190 |
| 16.736  | 0.000 | 7.438  | 5.302  | 865.25   | 0.0306  | 0.196 |
| 35.045  | 0.000 | 10.884 | 7.441  | 1728.90  | 0.0153  | 0.199 |
| 66.165  | 0.000 | 15.756 | 10.487 | 3454.76  | 0.0077  | 0.200 |
| 118.728 | 0.000 | 22.631 | 14.809 | 6903.59  | 0.0038  | 0.200 |
| 178.652 | 0.000 | 29.376 | 19.062 | 11443.34 | 0.0023  | 0.200 |

NUMBER OF STEPS = 1371  
 SURFACE LAYER (CENTER) LEVEL = 17.63 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 4279.10

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 11385.78

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 7 JETLAG 2000  
 TITLE Jet7

#### INPUT PARAMETERS

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

#### ENVIROMENTAL CONDITIONS

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

#### LENGTH & DILUTION SCALES

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.17E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.6461 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 3.2085 (m)       |
| po       | ... | 0.99916(g/cc) | sm    | ... | 35.3678          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 4.1745           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0166           |
| Fd       | ... | 56.80         | lm/lb | ... | 2.9107           |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 4.9660           |

Coflowing case:  
 dMj ... 0.1375  
 lm\* ... 1.8539  
 sm\* ... 34.3678

| X | Y | Z | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF. | VELOCITY |
|---|---|---|-----------------|---------------------|------------------|----------|
|---|---|---|-----------------|---------------------|------------------|----------|

| (m)     | (m)   | (m)    | (m)    |          | (sigmat) | (m/s) |
|---------|-------|--------|--------|----------|----------|-------|
| 0.000   | 0.000 | 0.000  | 0.030  | 1.00     | 27.0447  | 7.074 |
| 0.180   | 0.000 | 0.000  | 0.059  | 1.98     | 13.5224  | 3.672 |
| 0.543   | 0.000 | 0.001  | 0.113  | 3.89     | 6.8573   | 1.942 |
| 1.272   | 0.000 | 0.011  | 0.214  | 7.71     | 3.4470   | 1.074 |
| 2.735   | 0.000 | 0.074  | 0.391  | 15.33    | 1.7312   | 0.640 |
| 5.277   | 0.000 | 0.353  | 0.677  | 30.57    | 0.8674   | 0.424 |
| 8.232   | 0.000 | 0.904  | 1.108  | 61.08    | 0.4339   | 0.317 |
| 11.724  | 0.000 | 1.696  | 1.724  | 122.10   | 0.2170   | 0.262 |
| 16.601  | 0.000 | 2.814  | 2.581  | 243.95   | 0.1086   | 0.233 |
| 24.188  | 0.000 | 4.432  | 3.772  | 487.42   | 0.0544   | 0.218 |
| 36.477  | 0.000 | 6.769  | 5.432  | 973.91   | 0.0272   | 0.210 |
| 56.801  | 0.000 | 10.132 | 7.758  | 1946.01  | 0.0136   | 0.206 |
| 90.740  | 0.000 | 14.955 | 11.030 | 3888.47  | 0.0068   | 0.203 |
| 147.669 | 0.000 | 21.850 | 15.644 | 7770.03  | 0.0034   | 0.202 |
| 218.941 | 0.000 | 29.318 | 20.597 | 13425.61 | 0.0020   | 0.201 |

NUMBER OF STEPS = 1377

SURFACE LAYER (CENTER) LEVEL = 16.94 M ABOVE DISCHARGE PORT  
AVG DILUTION = 4872.06

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 13409.97

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 8 JETLAG 2000  
TITLE Jet8

#### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100

APPROX RATIO OF MASS/DMASS : 144.0

#### ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

#### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.17E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.6461 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 3.2085 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 4.1745           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0166           |
| Fd       | ... | 56.80         | lm/lb | ... | 2.9107           |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 4.9660           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.1375  |
| lm* | ... | 1.8539  |
| Sm* | ... | 34.3678 |

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 7.074             |
| -0.175   | 0.000    | 0.000    | 0.060                  | 1.98                | 13.5224                      | 3.475             |
| -0.528   | 0.000    | 0.001    | 0.123                  | 3.89                | 6.8612                       | 1.644             |
| -1.234   | 0.000    | 0.016    | 0.259                  | 7.69                | 3.4559                       | 0.728             |
| -2.578   | 0.000    | 0.178    | 0.533                  | 14.04               | 1.8905                       | 0.315             |
| -4.047   | 0.000    | 1.042    | 1.156                  | 27.24               | 0.9736                       | 0.130             |
| -4.008   | 0.000    | 1.523    | 1.824                  | 55.85               | 0.4746                       | 0.107             |
| -2.943   | 0.000    | 2.147    | 2.158                  | 108.51              | 0.2442                       | 0.148             |
| 0.156    | 0.000    | 3.312    | 2.800                  | 216.75              | 0.1223                       | 0.176             |
| 6.117    | 0.000    | 5.009    | 3.814                  | 433.05              | 0.0612                       | 0.190             |
| 16.736   | 0.000    | 7.438    | 5.302                  | 865.25              | 0.0306                       | 0.196             |
| 35.045   | 0.000    | 10.884   | 7.441                  | 1728.90             | 0.0153                       | 0.199             |
| 66.165   | 0.000    | 15.756   | 10.487                 | 3454.76             | 0.0077                       | 0.200             |
| 118.728  | 0.000    | 22.631   | 14.809                 | 6903.59             | 0.0038                       | 0.200             |
| 178.652  | 0.000    | 29.376   | 19.062                 | 11443.34            | 0.0023                       | 0.200             |

NUMBER OF STEPS = 1371

SURFACE LAYER (CENTER) LEVEL = 17.63 M ABOVE DISCHARGE PORT  
AVG DILUTION = 4279.10

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 11385.78

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 9 JETLAG 2000  
TITLE Jet9

#### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

#### ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

#### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.17E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.6461 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 3.2085 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 4.1745           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0166           |
| Fd       | ... | 56.80         | lm/lb | ... | 2.9107           |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 4.9660           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.1375  |
| lm* | ... | 1.8539  |
| Sm* | ... | 34.3678 |



| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 7.074             |
| 0.180    | 0.000    | 0.000    | 0.059                  | 1.98                | 13.5224                      | 3.672             |
| 0.543    | 0.000    | 0.001    | 0.113                  | 3.89                | 6.8573                       | 1.942             |
| 1.272    | 0.000    | 0.011    | 0.214                  | 7.71                | 3.4470                       | 1.074             |
| 2.735    | 0.000    | 0.074    | 0.391                  | 15.33               | 1.7312                       | 0.640             |
| 5.277    | 0.000    | 0.353    | 0.677                  | 30.57               | 0.8674                       | 0.424             |
| 8.232    | 0.000    | 0.904    | 1.108                  | 61.08               | 0.4339                       | 0.317             |
| 11.724   | 0.000    | 1.696    | 1.724                  | 122.10              | 0.2170                       | 0.262             |
| 16.601   | 0.000    | 2.814    | 2.581                  | 243.95              | 0.1086                       | 0.233             |
| 24.188   | 0.000    | 4.432    | 3.772                  | 487.42              | 0.0544                       | 0.218             |
| 36.477   | 0.000    | 6.769    | 5.432                  | 973.91              | 0.0272                       | 0.210             |
| 56.801   | 0.000    | 10.132   | 7.758                  | 1946.01             | 0.0136                       | 0.206             |
| 90.740   | 0.000    | 14.955   | 11.030                 | 3888.47             | 0.0068                       | 0.203             |
| 147.669  | 0.000    | 21.850   | 15.644                 | 7770.03             | 0.0034                       | 0.202             |
| 218.941  | 0.000    | 29.318   | 20.597                 | 13425.61            | 0.0020                       | 0.201             |

NUMBER OF STEPS = 1377

SURFACE LAYER (CENTER) LEVEL = 16.94 M ABOVE DISCHARGE PORT  
AVG DILUTION = 4872.06

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 13409.97

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 10 JETLAG 2000  
TITLE Jet10

#### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

#### ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

#### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0200 (m3/s) | Qj    | ... 2.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 1.41E-01 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 5.17E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 7.0736 (m/s)  | lm    | ... 1.8806 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.6461 (m)       |
| dp/pa    | ... 0.02635       | lM    | ... 3.2085 (m)       |
| po       | ... 0.99916(g/cc) | Sm    | ... 35.3678          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 4.1745           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0283           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0166           |
| Fd       | ... 56.80         | lm/lb | ... 2.9107           |
| Uj/Ua    | ... 35.37         | lM/lb | ... 4.9660           |

Coflowing case:

|     |             |
|-----|-------------|
| dmj | ... 0.1375  |
| lm* | ... 1.8539  |
| Sm* | ... 34.3678 |

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 7.074             |
| -0.175   | 0.000    | 0.000    | 0.060                  | 1.98                | 13.5224                      | 3.475             |
| -0.528   | 0.000    | 0.001    | 0.123                  | 3.89                | 6.8612                       | 1.644             |
| -1.234   | 0.000    | 0.016    | 0.259                  | 7.69                | 3.4559                       | 0.728             |
| -2.578   | 0.000    | 0.178    | 0.533                  | 14.04               | 1.8905                       | 0.315             |
| -4.047   | 0.000    | 1.042    | 1.156                  | 27.24               | 0.9736                       | 0.130             |
| -4.008   | 0.000    | 1.523    | 1.824                  | 55.85               | 0.4746                       | 0.107             |
| -2.943   | 0.000    | 2.147    | 2.158                  | 108.51              | 0.2442                       | 0.148             |
| 0.156    | 0.000    | 3.312    | 2.800                  | 216.75              | 0.1223                       | 0.176             |
| 6.117    | 0.000    | 5.009    | 3.814                  | 433.05              | 0.0612                       | 0.190             |
| 16.736   | 0.000    | 7.438    | 5.302                  | 865.25              | 0.0306                       | 0.196             |
| 35.045   | 0.000    | 10.884   | 7.441                  | 1728.90             | 0.0153                       | 0.199             |
| 66.165   | 0.000    | 15.756   | 10.487                 | 3454.76             | 0.0077                       | 0.200             |
| 118.728  | 0.000    | 22.631   | 14.809                 | 6903.59             | 0.0038                       | 0.200             |
| 178.652  | 0.000    | 29.376   | 19.062                 | 11443.34            | 0.0023                       | 0.200             |

NUMBER OF STEPS = 1371

SURFACE LAYER (CENTER) LEVEL = 17.63 M ABOVE DISCHARGE PORT

AVG DILUTION = 4279.10

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 11385.78

### **SIMULACIÓN 19**

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 1 JETLAG 2000  
TITLE Jet1

#### **INPUT PARAMETERS**

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

#### **ENVIROMENTAL CONDITIONS**

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

#### **LENGTH & DILUTION SCALES**

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.58E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 2.5844 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 1.6043 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 66.7919          |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 90.00         | lQ/lM | ... | 0.0331           |
| Fd       | ... | 28.40         | lm/lb | ... | 0.7277           |

Uj/Ua ... 35.37                      1m/lb ... 0.6207

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 3.537             |
| 0.002    | 0.178    | 0.000    | 0.059                  | 1.97                | 13.5224                      | 1.794             |
| 0.022    | 0.542    | 0.006    | 0.117                  | 3.87                | 6.8918                       | 0.904             |
| 0.099    | 1.108    | 0.038    | 0.230                  | 7.68                | 3.4609                       | 0.462             |
| 0.299    | 1.793    | 0.152    | 0.440                  | 15.29               | 1.7353                       | 0.251             |
| 0.722    | 2.488    | 0.430    | 0.772                  | 30.50               | 0.8694                       | 0.163             |
| 1.588    | 3.182    | 1.036    | 1.206                  | 60.87               | 0.4354                       | 0.133             |
| 3.166    | 3.816    | 2.148    | 1.769                  | 121.61              | 0.2179                       | 0.124             |
| 5.654    | 4.315    | 3.754    | 2.569                  | 243.08              | 0.1090                       | 0.117             |
| 9.581    | 4.707    | 5.921    | 3.714                  | 485.85              | 0.0545                       | 0.112             |
| 15.938   | 5.023    | 8.838    | 5.340                  | 970.97              | 0.0273                       | 0.108             |
| 26.414   | 5.284    | 12.809   | 7.640                  | 1940.38             | 0.0137                       | 0.106             |
| 43.834   | 5.501    | 18.271   | 10.893                 | 3877.54             | 0.0068                       | 0.104             |
| 72.930   | 5.682    | 25.842   | 15.489                 | 7748.56             | 0.0034                       | 0.103             |
| 88.104   | 5.741    | 29.343   | 17.636                 | 10010.69            | 0.0026                       | 0.102             |

NUMBER OF STEPS = 1335

SURFACE LAYER (CENTER) LEVEL = 18.36 M ABOVE DISCHARGE PORT  
AVG DILUTION = 3913.45

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 9981.14

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 2 JETLAG 2000  
TITLE Jet2

#### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

#### ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

#### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|              |               |           |                  |
|--------------|---------------|-----------|------------------|
| Total Q ...  | 0.0100 (m3/s) | Qj ...    | 1.00E-02 (m3/s)  |
| Port No. ... | 1             | Mj ...    | 3.54E-02 (m4/s2) |
| Depth ...    | 29.3000 (m)   | Bj ...    | 2.58E-03 (m4/s3) |
| Diameter ... | 0.0600 (m)    | lQ ...    | 0.0532 (m)       |
| Uj ...       | 3.5368 (m/s)  | lm ...    | 1.8806 (m)       |
| Ua ...       | 0.1000 (m/s)  | lb ...    | 2.5844 (m)       |
| dp/pa ...    | 0.02635       | lM ...    | 1.6043 (m)       |
| po ...       | 0.99916(g/cc) | Sm ...    | 35.3678          |
| pa ...       | 1.02621(g/cc) | Sb ...    | 66.7919          |
| Ver. ang ... | 0.00          | lQ/lm ... | 0.0283           |
| Hor. ang ... | 180.00        | lQ/lM ... | 0.0331           |
| Fd ...       | 28.40         | lm/lb ... | 0.7277           |
| Uj/Ua ...    | 35.37         | lM/lb ... | 0.6207           |

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 3.537             |
| -0.175   | 0.000    | 0.000    | 0.060                  | 1.98                | 13.5224                      | 1.738             |
| -0.528   | 0.000    | 0.006    | 0.123                  | 3.89                | 6.8612                       | 0.823             |
| -1.227   | 0.000    | 0.065    | 0.258                  | 7.70                | 3.4512                       | 0.367             |
| -2.390   | 0.000    | 0.550    | 0.502                  | 14.69               | 1.8067                       | 0.185             |
| -2.856   | 0.000    | 1.293    | 0.904                  | 29.37               | 0.9027                       | 0.115             |
| -2.774   | 0.000    | 1.868    | 1.433                  | 58.74               | 0.4512                       | 0.091             |
| -2.177   | 0.000    | 2.568    | 1.986                  | 116.59              | 0.2273                       | 0.094             |
| -0.344   | 0.000    | 3.952    | 2.694                  | 232.90              | 0.1138                       | 0.102             |
| 3.091    | 0.000    | 5.992    | 3.761                  | 465.49              | 0.0569                       | 0.105             |
| 8.953    | 0.000    | 8.786    | 5.316                  | 930.30              | 0.0285                       | 0.105             |
| 18.868   | 0.000    | 12.632   | 7.542                  | 1859.14             | 0.0143                       | 0.104             |
| 35.558   | 0.000    | 17.951   | 10.706                 | 3715.24             | 0.0071                       | 0.103             |
| 63.594   | 0.000    | 25.346   | 15.192                 | 7424.27             | 0.0036                       | 0.102             |
| 80.896   | 0.000    | 29.365   | 17.655                 | 9998.72             | 0.0026                       | 0.102             |

NUMBER OF STEPS = 1341

SURFACE LAYER (CENTER) LEVEL = 18.35 M ABOVE DISCHARGE PORT  
AVG DILUTION = 3882.61

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 9954.17

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 3 JETLAG 2000  
TITLE Jet3

#### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

#### ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

#### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.58E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 2.5844 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 1.6043 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 66.7919          |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0331           |
| Fd       | ... | 28.40         | lm/lb | ... | 0.7277           |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 0.6207           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0344  |
| lm* | ... | 1.8539  |
| Sm* | ... | 34.3678 |

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF. | VELOCITY |
|---------|-------|--------|-----------------|---------------------|------------------|----------|
| (m)     | (m)   | (m)    | (m)             |                     | (sigmat)         | (m/s)    |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447          | 3.537    |
| 0.180   | 0.000 | 0.000  | 0.059           | 1.98                | 13.5224          | 1.836    |
| 0.543   | 0.000 | 0.005  | 0.113           | 3.89                | 6.8573           | 0.971    |
| 1.268   | 0.000 | 0.044  | 0.213           | 7.71                | 3.4468           | 0.539    |
| 2.589   | 0.000 | 0.260  | 0.386           | 15.34               | 1.7295           | 0.328    |
| 4.122   | 0.000 | 0.781  | 0.655           | 30.64               | 0.8655           | 0.228    |
| 5.709   | 0.000 | 1.550  | 1.055           | 61.22               | 0.4330           | 0.175    |
| 7.652   | 0.000 | 2.610  | 1.637           | 122.36              | 0.2166           | 0.145    |
| 10.287  | 0.000 | 4.010  | 2.470           | 244.57              | 0.1083           | 0.128    |
| 14.201  | 0.000 | 5.869  | 3.648           | 488.78              | 0.0542           | 0.117    |
| 20.398  | 0.000 | 8.397  | 5.303           | 976.73              | 0.0271           | 0.111    |
| 30.547  | 0.000 | 11.899 | 7.629           | 1951.71             | 0.0136           | 0.107    |
| 47.436  | 0.000 | 16.807 | 10.903          | 3899.94             | 0.0068           | 0.104    |
| 75.729  | 0.000 | 23.728 | 15.522          | 7792.97             | 0.0034           | 0.103    |
| 102.250 | 0.000 | 29.392 | 19.297          | 11970.19            | 0.0022           | 0.102    |

NUMBER OF STEPS = 1360  
 SURFACE LAYER (CENTER) LEVEL = 17.76 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 4356.71

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 11895.63

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 CASE NO. 4 JETLAG 2000  
 TITLE Jet4

INPUT PARAMETERS  
 ^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^  

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.58E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 2.5844 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 1.6043 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 66.7919          |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0331           |
| Fd       | ... | 28.40         | lm/lb | ... | 0.7277           |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 0.6207           |

Coflowing case:  
 dMj ... 0.0344  
 lm\* ... 1.8539  
 Sm\* ... 34.3678

| X      | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------|-------|--------|-----------------|---------------------|------------------------------|----------|
| (m)    | (m)   | (m)    | (m)             |                     |                              | (m/s)    |
| 0.000  | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 3.537    |
| -0.175 | 0.000 | 0.000  | 0.060           | 1.98                | 13.5224                      | 1.738    |
| -0.528 | 0.000 | 0.006  | 0.123           | 3.89                | 6.8612                       | 0.823    |
| -1.227 | 0.000 | 0.065  | 0.258           | 7.70                | 3.4512                       | 0.367    |
| -2.390 | 0.000 | 0.550  | 0.502           | 14.69               | 1.8067                       | 0.185    |
| -2.856 | 0.000 | 1.293  | 0.904           | 29.37               | 0.9027                       | 0.115    |
| -2.774 | 0.000 | 1.868  | 1.433           | 58.74               | 0.4512                       | 0.091    |
| -2.177 | 0.000 | 2.568  | 1.986           | 116.59              | 0.2273                       | 0.094    |
| -0.344 | 0.000 | 3.952  | 2.694           | 232.90              | 0.1138                       | 0.102    |
| 3.091  | 0.000 | 5.992  | 3.761           | 465.49              | 0.0569                       | 0.105    |
| 8.953  | 0.000 | 8.786  | 5.316           | 930.30              | 0.0285                       | 0.105    |
| 18.868 | 0.000 | 12.632 | 7.542           | 1859.14             | 0.0143                       | 0.104    |
| 35.558 | 0.000 | 17.951 | 10.706          | 3715.24             | 0.0071                       | 0.103    |
| 63.594 | 0.000 | 25.346 | 15.192          | 7424.27             | 0.0036                       | 0.102    |
| 80.896 | 0.000 | 29.365 | 17.655          | 9998.72             | 0.0026                       | 0.102    |

NUMBER OF STEPS = 1341

SURFACE LAYER (CENTER) LEVEL = 18.35 M ABOVE DISCHARGE PORT  
AVG DILUTION = 3882.61

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 9954.17

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 5 JETLAG 2000  
TITLE Jet5

#### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

#### ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

#### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.58E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 2.5844 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 1.6043 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 66.7919          |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0331           |
| Fd       | ... | 28.40         | lm/lb | ... | 0.7277           |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 0.6207           |

Coflowing case:

|     |     |        |
|-----|-----|--------|
| dMj | ... | 0.0344 |
| lm* | ... | 1.8539 |

Sm\* ... 34.3678

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 3.537             |
| 0.180    | 0.000    | 0.000    | 0.059                  | 1.98                | 13.5224                      | 1.836             |
| 0.543    | 0.000    | 0.005    | 0.113                  | 3.89                | 6.8573                       | 0.971             |
| 1.268    | 0.000    | 0.044    | 0.213                  | 7.71                | 3.4468                       | 0.539             |
| 2.589    | 0.000    | 0.260    | 0.386                  | 15.34               | 1.7295                       | 0.328             |
| 4.122    | 0.000    | 0.781    | 0.655                  | 30.64               | 0.8655                       | 0.228             |
| 5.709    | 0.000    | 1.550    | 1.055                  | 61.22               | 0.4330                       | 0.175             |
| 7.652    | 0.000    | 2.610    | 1.637                  | 122.36              | 0.2166                       | 0.145             |
| 10.287   | 0.000    | 4.010    | 2.470                  | 244.57              | 0.1083                       | 0.128             |
| 14.201   | 0.000    | 5.869    | 3.648                  | 488.78              | 0.0542                       | 0.117             |
| 20.398   | 0.000    | 8.397    | 5.303                  | 976.73              | 0.0271                       | 0.111             |
| 30.547   | 0.000    | 11.899   | 7.629                  | 1951.71             | 0.0136                       | 0.107             |
| 47.436   | 0.000    | 16.807   | 10.903                 | 3899.94             | 0.0068                       | 0.104             |
| 75.729   | 0.000    | 23.728   | 15.522                 | 7792.97             | 0.0034                       | 0.103             |
| 102.250  | 0.000    | 29.392   | 19.297                 | 11970.19            | 0.0022                       | 0.102             |

NUMBER OF STEPS = 1360

SURFACE LAYER (CENTER) LEVEL = 17.76 M ABOVE DISCHARGE PORT  
AVG DILUTION = 4356.71

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 11895.63

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 6 JETLAG 2000  
TITLE Jet6

#### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

#### ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

#### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0100 (m3/s) | Qj    | ... 1.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 3.54E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 2.58E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 3.5368 (m/s)  | lm    | ... 1.8806 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb    | ... 2.5844 (m)       |
| dp/pa    | ... 0.02635       | lm    | ... 1.6043 (m)       |
| po       | ... 0.99916(g/cc) | Sm    | ... 35.3678          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 66.7919          |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0283           |
| Hor. ang | ... 180.00        | lQ/lm | ... 0.0331           |
| Fd       | ... 28.40         | lm/lb | ... 0.7277           |
| Uj/Ua    | ... 35.37         | lm/lb | ... 0.6207           |

Coflowing case:

dmj ... 0.0344  
lm\* ... 1.8539  
Sm\* ... 34.3678

| X      | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------|-------|--------|-----------------|---------------------|------------------------------|----------|
| (m)    | (m)   | (m)    | (m)             |                     |                              | (m/s)    |
| 0.000  | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 3.537    |
| -0.175 | 0.000 | 0.000  | 0.060           | 1.98                | 13.5224                      | 1.738    |
| -0.528 | 0.000 | 0.006  | 0.123           | 3.89                | 6.8612                       | 0.823    |
| -1.227 | 0.000 | 0.065  | 0.258           | 7.70                | 3.4512                       | 0.367    |
| -2.390 | 0.000 | 0.550  | 0.502           | 14.69               | 1.8067                       | 0.185    |
| -2.856 | 0.000 | 1.293  | 0.904           | 29.37               | 0.9027                       | 0.115    |
| -2.774 | 0.000 | 1.868  | 1.433           | 58.74               | 0.4512                       | 0.091    |
| -2.177 | 0.000 | 2.568  | 1.986           | 116.59              | 0.2273                       | 0.094    |
| -0.344 | 0.000 | 3.952  | 2.694           | 232.90              | 0.1138                       | 0.102    |
| 3.091  | 0.000 | 5.992  | 3.761           | 465.49              | 0.0569                       | 0.105    |
| 8.953  | 0.000 | 8.786  | 5.316           | 930.30              | 0.0285                       | 0.105    |
| 18.868 | 0.000 | 12.632 | 7.542           | 1859.14             | 0.0143                       | 0.104    |
| 35.558 | 0.000 | 17.951 | 10.706          | 3715.24             | 0.0071                       | 0.103    |
| 63.594 | 0.000 | 25.346 | 15.192          | 7424.27             | 0.0036                       | 0.102    |
| 80.896 | 0.000 | 29.365 | 17.655          | 9998.72             | 0.0026                       | 0.102    |

NUMBER OF STEPS = 1341

SURFACE LAYER (CENTER) LEVEL = 18.35 M ABOVE DISCHARGE PORT  
AVG DILUTION = 3882.61

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 9954.17

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 7 JETLAG 2000  
TITLE Jet7

#### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

#### ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

#### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0100 (m3/s) | Qj    | ... 1.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 3.54E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 2.58E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 3.5368 (m/s)  | lm    | ... 1.8806 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb    | ... 2.5844 (m)       |
| dp/pa    | ... 0.02635       | lM    | ... 1.6043 (m)       |
| po       | ... 0.99916(g/cc) | Sm    | ... 35.3678          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 66.7919          |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0283           |
| Hor. ang | ... 0.00          | lQ/lM | ... 0.0331           |
| Fd       | ... 28.40         | lm/lb | ... 0.7277           |
| Uj/Ua    | ... 35.37         | lM/lb | ... 0.6207           |



Coflowing case:  
 dMj ... 0.0344  
 l<sub>m</sub>\* ... 1.8539  
 S<sub>m</sub>\* ... 34.3678

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 3.537             |
| 0.180    | 0.000    | 0.000    | 0.059                  | 1.98                | 13.5224                      | 1.836             |
| 0.543    | 0.000    | 0.005    | 0.113                  | 3.89                | 6.8573                       | 0.971             |
| 1.268    | 0.000    | 0.044    | 0.213                  | 7.71                | 3.4468                       | 0.539             |
| 2.589    | 0.000    | 0.260    | 0.386                  | 15.34               | 1.7295                       | 0.328             |
| 4.122    | 0.000    | 0.781    | 0.655                  | 30.64               | 0.8655                       | 0.228             |
| 5.709    | 0.000    | 1.550    | 1.055                  | 61.22               | 0.4330                       | 0.175             |
| 7.652    | 0.000    | 2.610    | 1.637                  | 122.36              | 0.2166                       | 0.145             |
| 10.287   | 0.000    | 4.010    | 2.470                  | 244.57              | 0.1083                       | 0.128             |
| 14.201   | 0.000    | 5.869    | 3.648                  | 488.78              | 0.0542                       | 0.117             |
| 20.398   | 0.000    | 8.397    | 5.303                  | 976.73              | 0.0271                       | 0.111             |
| 30.547   | 0.000    | 11.899   | 7.629                  | 1951.71             | 0.0136                       | 0.107             |
| 47.436   | 0.000    | 16.807   | 10.903                 | 3899.94             | 0.0068                       | 0.104             |
| 75.729   | 0.000    | 23.728   | 15.522                 | 7792.97             | 0.0034                       | 0.103             |
| 102.250  | 0.000    | 29.392   | 19.297                 | 11970.19            | 0.0022                       | 0.102             |

NUMBER OF STEPS = 1360  
 SURFACE LAYER (CENTER) LEVEL = 17.76 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 4356.71

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 11895.63

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 CASE NO. 8 JETLAG 2000  
 TITLE Jet8

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100

APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^  

|                |                   |                                |                      |
|----------------|-------------------|--------------------------------|----------------------|
| Total Q        | ... 0.0100 (m3/s) | Qj                             | ... 1.00E-02 (m3/s)  |
| Port No.       | ... 1             | Mj                             | ... 3.54E-02 (m4/s2) |
| Depth          | ... 29.3000 (m)   | Bj                             | ... 2.58E-03 (m4/s3) |
| Diameter       | ... 0.0600 (m)    | l <sub>Q</sub>                 | ... 0.0532 (m)       |
| U <sub>j</sub> | ... 3.5368 (m/s)  | l <sub>m</sub>                 | ... 1.8806 (m)       |
| U <sub>a</sub> | ... 0.1000 (m/s)  | l <sub>b</sub>                 | ... 2.5844 (m)       |
| dp/pa          | ... 0.02635       | l <sub>M</sub>                 | ... 1.6043 (m)       |
| po             | ... 0.99916(g/cc) | S <sub>m</sub>                 | ... 35.3678          |
| pa             | ... 1.02621(g/cc) | S <sub>b</sub>                 | ... 66.7919          |
| Ver. ang       | ... 0.00          | l <sub>Q</sub> /l <sub>m</sub> | ... 0.0283           |
| Hor. ang       | ... 180.00        | l <sub>Q</sub> /l <sub>M</sub> | ... 0.0331           |
| Fd             | ... 28.40         | l <sub>m</sub> /l <sub>b</sub> | ... 0.7277           |

Uj/Ua ... 35.37                      1m/lb ... 0.6207

Coflowing case:

dMj ... 0.0344  
1m\* ... 1.8539  
Sm\* ... 34.3678

| X      | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF. | VELOCITY |
|--------|-------|--------|-----------------|---------------------|------------------|----------|
| (m)    | (m)   | (m)    | (m)             |                     | (sigmat)         | (m/s)    |
| 0.000  | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447          | 3.537    |
| -0.175 | 0.000 | 0.000  | 0.060           | 1.98                | 13.5224          | 1.738    |
| -0.528 | 0.000 | 0.006  | 0.123           | 3.89                | 6.8612           | 0.823    |
| -1.227 | 0.000 | 0.065  | 0.258           | 7.70                | 3.4512           | 0.367    |
| -2.390 | 0.000 | 0.550  | 0.502           | 14.69               | 1.8067           | 0.185    |
| -2.856 | 0.000 | 1.293  | 0.904           | 29.37               | 0.9027           | 0.115    |
| -2.774 | 0.000 | 1.868  | 1.433           | 58.74               | 0.4512           | 0.091    |
| -2.177 | 0.000 | 2.568  | 1.986           | 116.59              | 0.2273           | 0.094    |
| -0.344 | 0.000 | 3.952  | 2.694           | 232.90              | 0.1138           | 0.102    |
| 3.091  | 0.000 | 5.992  | 3.761           | 465.49              | 0.0569           | 0.105    |
| 8.953  | 0.000 | 8.786  | 5.316           | 930.30              | 0.0285           | 0.105    |
| 18.868 | 0.000 | 12.632 | 7.542           | 1859.14             | 0.0143           | 0.104    |
| 35.558 | 0.000 | 17.951 | 10.706          | 3715.24             | 0.0071           | 0.103    |
| 63.594 | 0.000 | 25.346 | 15.192          | 7424.27             | 0.0036           | 0.102    |
| 80.896 | 0.000 | 29.365 | 17.655          | 9998.72             | 0.0026           | 0.102    |

NUMBER OF STEPS = 1341

SURFACE LAYER (CENTER) LEVEL = 18.35 M ABOVE DISCHARGE PORT

AVG DILUTION = 3882.61

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 9954.17

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 9 JETLAG 2000

TITLE Jet9

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0100 (m3/s) | Qj    | ... 1.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 3.54E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 2.58E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 3.5368 (m/s)  | lm    | ... 1.8806 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb    | ... 2.5844 (m)       |
| dp/pa    | ... 0.02635       | lM    | ... 1.6043 (m)       |
| po       | ... 0.99916(g/cc) | Sm    | ... 35.3678          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 66.7919          |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0283           |
| Hor. ang | ... 0.00          | lQ/lM | ... 0.0331           |

Fd ... 28.40 1m/lb ... 0.7277  
Uj/Ua ... 35.37 1M/lb ... 0.6207

Coflowing case:  
dmj ... 0.0344  
1m\* ... 1.8539  
Sm\* ... 34.3678

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|---------|-------|--------|-----------------|---------------------|------------------------------|----------|
| (m)     | (m)   | (m)    | (m)             |                     |                              | (m/s)    |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 3.537    |
| 0.180   | 0.000 | 0.000  | 0.059           | 1.98                | 13.5224                      | 1.836    |
| 0.543   | 0.000 | 0.005  | 0.113           | 3.89                | 6.8573                       | 0.971    |
| 1.268   | 0.000 | 0.044  | 0.213           | 7.71                | 3.4468                       | 0.539    |
| 2.589   | 0.000 | 0.260  | 0.386           | 15.34               | 1.7295                       | 0.328    |
| 4.122   | 0.000 | 0.781  | 0.655           | 30.64               | 0.8655                       | 0.228    |
| 5.709   | 0.000 | 1.550  | 1.055           | 61.22               | 0.4330                       | 0.175    |
| 7.652   | 0.000 | 2.610  | 1.637           | 122.36              | 0.2166                       | 0.145    |
| 10.287  | 0.000 | 4.010  | 2.470           | 244.57              | 0.1083                       | 0.128    |
| 14.201  | 0.000 | 5.869  | 3.648           | 488.78              | 0.0542                       | 0.117    |
| 20.398  | 0.000 | 8.397  | 5.303           | 976.73              | 0.0271                       | 0.111    |
| 30.547  | 0.000 | 11.899 | 7.629           | 1951.71             | 0.0136                       | 0.107    |
| 47.436  | 0.000 | 16.807 | 10.903          | 3899.94             | 0.0068                       | 0.104    |
| 75.729  | 0.000 | 23.728 | 15.522          | 7792.97             | 0.0034                       | 0.103    |
| 102.250 | 0.000 | 29.392 | 19.297          | 11970.19            | 0.0022                       | 0.102    |

NUMBER OF STEPS = 1360  
SURFACE LAYER (CENTER) LEVEL = 17.76 M ABOVE DISCHARGE PORT  
AVG DILUTION = 4356.71

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 11895.63

1  
ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
CASE NO. 10 JETLAG 2000  
TITLE Jet10

INPUT PARAMETERS  
^^^^^^^^^^^^^^^^^^^^  
ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
^^^^^^^^^^^^^^^^^^^^  
DEPTH(m) S T(C) SIGMAT U(m/s)  
EXIT 29.30 0.00 15.00 -0.84 3.537  
.....  
AMBIENT 0.00 35.00 14.00 26.21 0.100  
30.00 35.00 14.00 26.21 0.100

LENGTH & DILUTION SCALES  
^^^^^^^^^^^^^^^^^^^^  
Total Q ... 0.0100 (m3/s) Qj ... 1.00E-02 (m3/s)  
Port No. ... 1 Mj ... 3.54E-02 (m4/s2)  
Depth ... 29.3000 (m) Bj ... 2.58E-03 (m4/s3)  
Diameter ... 0.0600 (m) lQ ... 0.0532 (m)  
Uj ... 3.5368 (m/s) 1m ... 1.8806 (m)  
Ua ... 0.1000 (m/s) lb ... 2.5844 (m)  
dp/pa ... 0.02635 1M ... 1.6043 (m)  
po ... 0.99916(g/cc) Sm ... 35.3678  
pa ... 1.02621(g/cc) Sb ... 66.7919

Ver. ang ... 0.00                      lQ/lm ... 0.0283  
 Hor. ang ... 180.00                  lQ/lm ... 0.0331  
 Fd ... 28.40                          lm/lb ... 0.7277  
 Uj/Ua ... 35.37                      lM/lb ... 0.6207

Coflowing case:  
 dmj ... 0.0344  
 lm\* ... 1.8539  
 Sm\* ... 34.3678

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 3.537             |
| -0.175   | 0.000    | 0.000    | 0.060                  | 1.98                | 13.5224                      | 1.738             |
| -0.528   | 0.000    | 0.006    | 0.123                  | 3.89                | 6.8612                       | 0.823             |
| -1.227   | 0.000    | 0.065    | 0.258                  | 7.70                | 3.4512                       | 0.367             |
| -2.390   | 0.000    | 0.550    | 0.502                  | 14.69               | 1.8067                       | 0.185             |
| -2.856   | 0.000    | 1.293    | 0.904                  | 29.37               | 0.9027                       | 0.115             |
| -2.774   | 0.000    | 1.868    | 1.433                  | 58.74               | 0.4512                       | 0.091             |
| -2.177   | 0.000    | 2.568    | 1.986                  | 116.59              | 0.2273                       | 0.094             |
| -0.344   | 0.000    | 3.952    | 2.694                  | 232.90              | 0.1138                       | 0.102             |
| 3.091    | 0.000    | 5.992    | 3.761                  | 465.49              | 0.0569                       | 0.105             |
| 8.953    | 0.000    | 8.786    | 5.316                  | 930.30              | 0.0285                       | 0.105             |
| 18.868   | 0.000    | 12.632   | 7.542                  | 1859.14             | 0.0143                       | 0.104             |
| 35.558   | 0.000    | 17.951   | 10.706                 | 3715.24             | 0.0071                       | 0.103             |
| 63.594   | 0.000    | 25.346   | 15.192                 | 7424.27             | 0.0036                       | 0.102             |
| 80.896   | 0.000    | 29.365   | 17.655                 | 9998.72             | 0.0026                       | 0.102             |

NUMBER OF STEPS = 1341  
 SURFACE LAYER (CENTER) LEVEL = 18.35 M ABOVE DISCHARGE PORT

AVG DILUTION = 3882.61

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 9954.17

## SIMULACIÓN 20

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 1 JETLAG 2000  
 TITLE Jet1

### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

### ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA  

|          |                   |    |                      |
|----------|-------------------|----|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj | ... 3.88E-03 (m4/s3) |

|          |     |               |       |     |            |
|----------|-----|---------------|-------|-----|------------|
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m) |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 2.8209 (m) |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 3.8766 (m) |
| dp/pa    | ... | 0.02635       | lM    | ... | 2.4064 (m) |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 53.0516    |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 100.1878   |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0188     |
| Hor. ang | ... | 90.00         | lQ/lM | ... | 0.0221     |
| Fd       | ... | 42.60         | lm/lb | ... | 0.7277     |
| Uj/Ua    | ... | 53.05         | lM/lb | ... | 0.6207     |

| X      | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------|-------|--------|-----------------|---------------------|------------------------------|----------|
| (m)    | (m)   | (m)    | (m)             |                     |                              | (m/s)    |
| 0.000  | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 5.305    |
| 0.002  | 0.177 | 0.000  | 0.059           | 1.98                | 13.5224                      | 2.681    |
| 0.015  | 0.545 | 0.003  | 0.117           | 3.87                | 6.8936                       | 1.354    |
| 0.076  | 1.221 | 0.022  | 0.231           | 7.67                | 3.4637                       | 0.684    |
| 0.263  | 2.169 | 0.110  | 0.453           | 15.27               | 1.7376                       | 0.356    |
| 0.685  | 3.210 | 0.365  | 0.842           | 30.46               | 0.8706                       | 0.205    |
| 1.549  | 4.251 | 0.945  | 1.407           | 60.79               | 0.4360                       | 0.147    |
| 3.269  | 5.280 | 2.156  | 2.121           | 121.41              | 0.2183                       | 0.129    |
| 6.151  | 6.147 | 4.134  | 3.094           | 242.67              | 0.1092                       | 0.121    |
| 10.650 | 6.822 | 6.870  | 4.486           | 485.07              | 0.0546                       | 0.115    |
| 17.819 | 7.359 | 10.542 | 6.473           | 969.50              | 0.0273                       | 0.110    |
| 29.520 | 7.797 | 15.505 | 9.288           | 1937.52             | 0.0137                       | 0.107    |
| 48.887 | 8.159 | 22.291 | 13.269          | 3871.91             | 0.0068                       | 0.105    |
| 72.577 | 8.399 | 29.326 | 17.486          | 6644.27             | 0.0040                       | 0.104    |

NUMBER OF STEPS = 1276

SURFACE LAYER (CENTER) LEVEL = 18.35 M ABOVE DISCHARGE PORT

AVG DILUTION = 2662.50

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 6632.44

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 2 JETLAG 2000  
TITLE Jet2

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |    |     |                  |
|----------|-----|---------------|----|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj | ... | 3.88E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm | ... | 2.8209 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb | ... | 3.8766 (m)       |
| dp/pa    | ... | 0.02635       | lM | ... | 2.4064 (m)       |
| po       | ... | 0.99916(g/cc) | Sm | ... | 53.0516          |

|          |     |               |       |     |          |
|----------|-----|---------------|-------|-----|----------|
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 100.1878 |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0188   |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0221   |
| Fd       | ... | 42.60         | lm/lb | ... | 0.7277   |
| Uj/Ua    | ... | 53.05         | lM/lb | ... | 0.6207   |

| X      | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------|-------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)    | (m)   | (m)    | (m)             |                     |                              |                   |
| 0.000  | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 5.305             |
| -0.176 | 0.000 | 0.000  | 0.060           | 1.98                | 13.5224                      | 2.631             |
| -0.530 | 0.000 | 0.003  | 0.121           | 3.89                | 6.8605                       | 1.271             |
| -1.239 | 0.000 | 0.027  | 0.250           | 7.70                | 3.4506                       | 0.589             |
| -2.623 | 0.000 | 0.269  | 0.509           | 14.75               | 1.7988                       | 0.272             |
| -4.096 | 0.000 | 1.323  | 0.974           | 29.29               | 0.9054                       | 0.147             |
| -4.364 | 0.000 | 2.323  | 1.671           | 58.62               | 0.4522                       | 0.100             |
| -4.005 | 0.000 | 3.152  | 2.493           | 117.18              | 0.2262                       | 0.090             |
| -2.452 | 0.000 | 4.587  | 3.365           | 232.66              | 0.1139                       | 0.098             |
| 1.244  | 0.000 | 7.098  | 4.623           | 464.95              | 0.0570                       | 0.104             |
| 7.681  | 0.000 | 10.582 | 6.500           | 929.26              | 0.0285                       | 0.105             |
| 18.616 | 0.000 | 15.362 | 9.209           | 1857.14             | 0.0143                       | 0.105             |
| 37.066 | 0.000 | 21.953 | 13.073          | 3711.39             | 0.0071                       | 0.104             |
| 61.617 | 0.000 | 29.317 | 17.484          | 6593.27             | 0.0040                       | 0.103             |

NUMBER OF STEPS = 1281  
 SURFACE LAYER (CENTER) LEVEL = 18.35 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 2614.45

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 6585.55

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 3 JETLAG 2000  
 TITLE Jet3

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^  

|         |          |       |       |        |        |
|---------|----------|-------|-------|--------|--------|
|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^  

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 3.88E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 2.8209 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 3.8766 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 2.4064 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 53.0516          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 100.1878         |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0188           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0221           |
| Fd       | ... | 42.60         | lm/lb | ... | 0.7277           |
| Uj/Ua    | ... | 53.05         | lM/lb | ... | 0.6207           |

Coflowing case:  
 dmj ... 0.0781  
 lm\* ... 2.7942  
 Sm\* ... 52.0516

| X      | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------|-------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)    | (m)   | (m)    | (m)             |                     |                              |                   |
| 0.000  | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 5.305             |
| 0.179  | 0.000 | 0.000  | 0.059           | 1.98                | 13.5224                      | 2.730             |
| 0.540  | 0.000 | 0.002  | 0.114           | 3.89                | 6.8579                       | 1.419             |
| 1.264  | 0.000 | 0.021  | 0.220           | 7.71                | 3.4476                       | 0.762             |
| 2.692  | 0.000 | 0.145  | 0.410           | 15.32               | 1.7316                       | 0.436             |
| 4.923  | 0.000 | 0.658  | 0.723           | 30.57               | 0.8674                       | 0.280             |
| 7.234  | 0.000 | 1.595  | 1.200           | 61.10               | 0.4338                       | 0.203             |
| 9.792  | 0.000 | 2.920  | 1.902           | 122.13              | 0.2170                       | 0.161             |
| 13.065 | 0.000 | 4.707  | 2.916           | 244.14              | 0.1085                       | 0.137             |
| 17.679 | 0.000 | 7.061  | 4.360           | 487.98              | 0.0543                       | 0.123             |
| 24.738 | 0.000 | 10.218 | 6.393           | 975.20              | 0.0272                       | 0.114             |
| 36.100 | 0.000 | 14.546 | 9.248           | 1948.70             | 0.0136                       | 0.109             |
| 54.859 | 0.000 | 20.577 | 13.264          | 3893.94             | 0.0068                       | 0.106             |
| 86.178 | 0.000 | 29.054 | 18.924          | 7781.01             | 0.0034                       | 0.104             |
| 87.391 | 0.000 | 29.356 | 19.125          | 7944.28             | 0.0033                       | 0.104             |

NUMBER OF STEPS = 1301

SURFACE LAYER (CENTER) LEVEL = 17.85 M ABOVE DISCHARGE PORT

AVG DILUTION = 2930.34

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 7914.07

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 4 JETLAG 2000  
 TITLE Jet4

INPUT PARAMETERS  
 ^^^

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj    | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 3.88E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | lm    | ... 2.8209 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb    | ... 3.8766 (m)       |
| dp/pa    | ... 0.02635       | lM    | ... 2.4064 (m)       |
| po       | ... 0.99916(g/cc) | Sm    | ... 53.0516          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 100.1878         |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0188           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0221           |

Fd ... 42.60                      1m/1b ... 0.7277  
 Uj/Ua ... 53.05                    1m/1b ... 0.6207  
  
 Coflowing case:  
 dmj ... 0.0781  
 1m\* ... 2.7942  
 Sm\* ... 52.0516

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 5.305             |
| -0.176   | 0.000    | 0.000    | 0.060                  | 1.98                | 13.5224                      | 2.631             |
| -0.530   | 0.000    | 0.003    | 0.121                  | 3.89                | 6.8605                       | 1.271             |
| -1.239   | 0.000    | 0.027    | 0.250                  | 7.70                | 3.4506                       | 0.589             |
| -2.623   | 0.000    | 0.269    | 0.509                  | 14.75               | 1.7988                       | 0.272             |
| -4.096   | 0.000    | 1.323    | 0.974                  | 29.29               | 0.9054                       | 0.147             |
| -4.364   | 0.000    | 2.323    | 1.671                  | 58.62               | 0.4522                       | 0.100             |
| -4.005   | 0.000    | 3.152    | 2.493                  | 117.18              | 0.2262                       | 0.090             |
| -2.452   | 0.000    | 4.587    | 3.365                  | 232.66              | 0.1139                       | 0.098             |
| 1.244    | 0.000    | 7.098    | 4.623                  | 464.95              | 0.0570                       | 0.104             |
| 7.681    | 0.000    | 10.582   | 6.500                  | 929.26              | 0.0285                       | 0.105             |
| 18.616   | 0.000    | 15.362   | 9.209                  | 1857.14             | 0.0143                       | 0.105             |
| 37.066   | 0.000    | 21.953   | 13.073                 | 3711.39             | 0.0071                       | 0.104             |
| 61.617   | 0.000    | 29.317   | 17.484                 | 6593.27             | 0.0040                       | 0.103             |

NUMBER OF STEPS = 1281  
 SURFACE LAYER (CENTER) LEVEL = 18.35 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 2614.45

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 6585.55

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 CASE NO. 5 JETLAG 2000  
 TITLE Jet5

INPUT PARAMETERS  
 ^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^  

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj    | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 3.88E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | lm    | ... 2.8209 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb    | ... 3.8766 (m)       |
| dp/pa    | ... 0.02635       | lM    | ... 2.4064 (m)       |
| po       | ... 0.99916(g/cc) | Sm    | ... 53.0516          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 100.1878         |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0188           |
| Hor. ang | ... 0.00          | lQ/lM | ... 0.0221           |



Fd ... 42.60                      1m/1b ... 0.7277  
 Uj/Ua ... 53.05                    1m/1b ... 0.6207  
  
 Coflowing case:  
 dmj ... 0.0781  
 1m\* ... 2.7942  
 Sm\* ... 52.0516

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 5.305             |
| 0.179    | 0.000    | 0.000    | 0.059                  | 1.98                | 13.5224                      | 2.730             |
| 0.540    | 0.000    | 0.002    | 0.114                  | 3.89                | 6.8579                       | 1.419             |
| 1.264    | 0.000    | 0.021    | 0.220                  | 7.71                | 3.4476                       | 0.762             |
| 2.692    | 0.000    | 0.145    | 0.410                  | 15.32               | 1.7316                       | 0.436             |
| 4.923    | 0.000    | 0.658    | 0.723                  | 30.57               | 0.8674                       | 0.280             |
| 7.234    | 0.000    | 1.595    | 1.200                  | 61.10               | 0.4338                       | 0.203             |
| 9.792    | 0.000    | 2.920    | 1.902                  | 122.13              | 0.2170                       | 0.161             |
| 13.065   | 0.000    | 4.707    | 2.916                  | 244.14              | 0.1085                       | 0.137             |
| 17.679   | 0.000    | 7.061    | 4.360                  | 487.98              | 0.0543                       | 0.123             |
| 24.738   | 0.000    | 10.218   | 6.393                  | 975.20              | 0.0272                       | 0.114             |
| 36.100   | 0.000    | 14.546   | 9.248                  | 1948.70             | 0.0136                       | 0.109             |
| 54.859   | 0.000    | 20.577   | 13.264                 | 3893.94             | 0.0068                       | 0.106             |
| 86.178   | 0.000    | 29.054   | 18.924                 | 7781.01             | 0.0034                       | 0.104             |
| 87.391   | 0.000    | 29.356   | 19.125                 | 7944.28             | 0.0033                       | 0.104             |

NUMBER OF STEPS = 1301  
 SURFACE LAYER (CENTER) LEVEL = 17.85 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 2930.34

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 7914.07

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 6 JETLAG 2000  
 TITLE Jet6

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^  

|          |                   |    |                      |
|----------|-------------------|----|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj | ... 3.88E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | 1m | ... 2.8209 (m)       |
| Ua       | ... 0.1000 (m/s)  | 1b | ... 3.8766 (m)       |
| dp/pa    | ... 0.02635       | 1M | ... 2.4064 (m)       |
| po       | ... 0.99916(g/cc) | Sm | ... 53.0516          |
| pa       | ... 1.02621(g/cc) | Sb | ... 100.1878         |

Ver. ang ... 0.00                      lQ/lm ... 0.0188  
 Hor. ang ... 180.00                  lQ/lm ... 0.0221  
 Fd ... 42.60                          lm/lb ... 0.7277  
 Uj/Ua ... 53.05                      lm/lb ... 0.6207

Coflowing case:  
 dmj ... 0.0781  
 lm\* ... 2.7942  
 Sm\* ... 52.0516

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 5.305             |
| -0.176   | 0.000    | 0.000    | 0.060                  | 1.98                | 13.5224                      | 2.631             |
| -0.530   | 0.000    | 0.003    | 0.121                  | 3.89                | 6.8605                       | 1.271             |
| -1.239   | 0.000    | 0.027    | 0.250                  | 7.70                | 3.4506                       | 0.589             |
| -2.623   | 0.000    | 0.269    | 0.509                  | 14.75               | 1.7988                       | 0.272             |
| -4.096   | 0.000    | 1.323    | 0.974                  | 29.29               | 0.9054                       | 0.147             |
| -4.364   | 0.000    | 2.323    | 1.671                  | 58.62               | 0.4522                       | 0.100             |
| -4.005   | 0.000    | 3.152    | 2.493                  | 117.18              | 0.2262                       | 0.090             |
| -2.452   | 0.000    | 4.587    | 3.365                  | 232.66              | 0.1139                       | 0.098             |
| 1.244    | 0.000    | 7.098    | 4.623                  | 464.95              | 0.0570                       | 0.104             |
| 7.681    | 0.000    | 10.582   | 6.500                  | 929.26              | 0.0285                       | 0.105             |
| 18.616   | 0.000    | 15.362   | 9.209                  | 1857.14             | 0.0143                       | 0.105             |
| 37.066   | 0.000    | 21.953   | 13.073                 | 3711.39             | 0.0071                       | 0.104             |
| 61.617   | 0.000    | 29.317   | 17.484                 | 6593.27             | 0.0040                       | 0.103             |

NUMBER OF STEPS = 1281  
 SURFACE LAYER (CENTER) LEVEL = 18.35 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 2614.45

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 6585.55

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 CASE NO. 7 JETLAG 2000  
 TITLE Jet7

INPUT PARAMETERS  
 ^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

#### LENGTH & DILUTION SCALES

^^  

|          |                   |    |                      |
|----------|-------------------|----|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj | ... 3.88E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | lm | ... 2.8209 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb | ... 3.8766 (m)       |
| dp/pa    | ... 0.02635       | lM | ... 2.4064 (m)       |
| po       | ... 0.99916(g/cc) | Sm | ... 53.0516          |

pa ... 1.02621(g/cc)      Sb ... 100.1878  
 Ver. ang ... 0.00      lQ/lm ... 0.0188  
 Hor. ang ... 0.00      lQ/lM ... 0.0221  
 Fd ... 42.60      lm/lb ... 0.7277  
 Uj/Ua ... 53.05      lM/lb ... 0.6207

Coflowing case:  
 dMj ... 0.0781  
 lm\* ... 2.7942  
 sm\* ... 52.0516

| X      | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------|-------|--------|-----------------|---------------------|------------------------------|----------|
| (m)    | (m)   | (m)    | (m)             |                     |                              | (m/s)    |
| 0.000  | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 5.305    |
| 0.179  | 0.000 | 0.000  | 0.059           | 1.98                | 13.5224                      | 2.730    |
| 0.540  | 0.000 | 0.002  | 0.114           | 3.89                | 6.8579                       | 1.419    |
| 1.264  | 0.000 | 0.021  | 0.220           | 7.71                | 3.4476                       | 0.762    |
| 2.692  | 0.000 | 0.145  | 0.410           | 15.32               | 1.7316                       | 0.436    |
| 4.923  | 0.000 | 0.658  | 0.723           | 30.57               | 0.8674                       | 0.280    |
| 7.234  | 0.000 | 1.595  | 1.200           | 61.10               | 0.4338                       | 0.203    |
| 9.792  | 0.000 | 2.920  | 1.902           | 122.13              | 0.2170                       | 0.161    |
| 13.065 | 0.000 | 4.707  | 2.916           | 244.14              | 0.1085                       | 0.137    |
| 17.679 | 0.000 | 7.061  | 4.360           | 487.98              | 0.0543                       | 0.123    |
| 24.738 | 0.000 | 10.218 | 6.393           | 975.20              | 0.0272                       | 0.114    |
| 36.100 | 0.000 | 14.546 | 9.248           | 1948.70             | 0.0136                       | 0.109    |
| 54.859 | 0.000 | 20.577 | 13.264          | 3893.94             | 0.0068                       | 0.106    |
| 86.178 | 0.000 | 29.054 | 18.924          | 7781.01             | 0.0034                       | 0.104    |
| 87.391 | 0.000 | 29.356 | 19.125          | 7944.28             | 0.0033                       | 0.104    |

NUMBER OF STEPS = 1301  
 SURFACE LAYER (CENTER) LEVEL = 17.85 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 2930.34

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 7914.07

1 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 8 JETLAG 2000  
 TITLE Jet8

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^  

|          |                   |    |                      |
|----------|-------------------|----|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj | ... 3.88E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | lm | ... 2.8209 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb | ... 3.8766 (m)       |
| dp/pa    | ... 0.02635       | lM | ... 2.4064 (m)       |

```

po      ... 0.99916(g/cc)      Sm ... 53.0516
pa      ... 1.02621(g/cc)      Sb ... 100.1878
Ver. ang ... 0.00              lq/lm ... 0.0188
Hor. ang ... 180.00            lQ/lM ... 0.0221
Fd      ... 42.60              lm/lb ... 0.7277
Uj/Ua   ... 53.05              lM/lb ... 0.6207

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Coflowing case:
dmj     ... 0.0781
lm*     ... 2.7942
Sm*     ... 52.0516

```

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 5.305             |
| -0.176   | 0.000    | 0.000    | 0.060                  | 1.98                | 13.5224                      | 2.631             |
| -0.530   | 0.000    | 0.003    | 0.121                  | 3.89                | 6.8605                       | 1.271             |
| -1.239   | 0.000    | 0.027    | 0.250                  | 7.70                | 3.4506                       | 0.589             |
| -2.623   | 0.000    | 0.269    | 0.509                  | 14.75               | 1.7988                       | 0.272             |
| -4.096   | 0.000    | 1.323    | 0.974                  | 29.29               | 0.9054                       | 0.147             |
| -4.364   | 0.000    | 2.323    | 1.671                  | 58.62               | 0.4522                       | 0.100             |
| -4.005   | 0.000    | 3.152    | 2.493                  | 117.18              | 0.2262                       | 0.090             |
| -2.452   | 0.000    | 4.587    | 3.365                  | 232.66              | 0.1139                       | 0.098             |
| 1.244    | 0.000    | 7.098    | 4.623                  | 464.95              | 0.0570                       | 0.104             |
| 7.681    | 0.000    | 10.582   | 6.500                  | 929.26              | 0.0285                       | 0.105             |
| 18.616   | 0.000    | 15.362   | 9.209                  | 1857.14             | 0.0143                       | 0.105             |
| 37.066   | 0.000    | 21.953   | 13.073                 | 3711.39             | 0.0071                       | 0.104             |
| 61.617   | 0.000    | 29.317   | 17.484                 | 6593.27             | 0.0040                       | 0.103             |

```

NUMBER OF STEPS = 1281
SURFACE LAYER (CENTER) LEVEL = 18.35 M ABOVE DISCHARGE PORT
AVG DILUTION = 2614.45

```

```

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE
AVG DILUTION AT WATER SURFACE = 6585.55

```

1 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

```

CASE NO. 9 JETLAG 2000
TITLE Jet9

```

```

INPUT PARAMETERS
AAAAAAAAAAAAAAAAAAAA
ENTRAINMENT HYPOTHESIS : ASYMMETRIC
SHEAR ENTRAINMENT      : VARIABLE (0 - 0.085)
COFLOW FACTOR          : STANDARD
TIME STEP CONTRL       : VARIABLE ( > 0.985 )
MAX NUMBER OF TIME STEPS : 1500
PRINTOUT INTERVAL      : 100
MAX NUMBER OF ITERATIONS : 5
ITERATION ERROR BOUND   : 0.00100
APPROX RATIO OF MASS/DMASS : 144.0

```

```

ENVIROMENTAL CONDITIONS
AAAAAAAAAAAAAAAAAAAA
      DEPTH(m)  S      T(C)  SIGMAT  U(m/s)
EXIT   29.30   0.00   15.00   -0.84   5.305
.....
AMBIENT 0.00   35.00   14.00   26.21   0.100
      30.00   35.00   14.00   26.21   0.100

```

```

LENGTH & DILUTION SCALES
AAAAAAAAAAAAAAAAAAAA
Total Q ... 0.0150 (m3/s)      Qj ... 1.50E-02 (m3/s)
Port No. ... 1                Mj ... 7.96E-02 (m4/s2)
Depth ... 29.3000 (m)         Bj ... 3.88E-03 (m4/s3)
Diameter ... 0.0600 (m)       lQ ... 0.0532 (m)
Uj ... 5.3052 (m/s)           lm ... 2.8209 (m)
Ua ... 0.1000 (m/s)           lb ... 3.8766 (m)
dp/pa ... 0.02635             lM ... 2.4064 (m)

```



|          |     |               |       |     |            |
|----------|-----|---------------|-------|-----|------------|
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 3.8766 (m) |
| dp/pa    | ... | 0.02635       | lm    | ... | 2.4064 (m) |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 53.0516    |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 100.1878   |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0188     |
| Hor. ang | ... | 180.00        | lQ/lm | ... | 0.0221     |
| Fd       | ... | 42.60         | lm/lb | ... | 0.7277     |
| Uj/Ua    | ... | 53.05         | lm/lb | ... | 0.6207     |

Coflowing case:  
dmj ... 0.0781  
lm\* ... 2.7942  
Sm\* ... 52.0516

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 5.305             |
| -0.176   | 0.000    | 0.000    | 0.060                  | 1.98                | 13.5224                      | 2.631             |
| -0.530   | 0.000    | 0.003    | 0.121                  | 3.89                | 6.8605                       | 1.271             |
| -1.239   | 0.000    | 0.027    | 0.250                  | 7.70                | 3.4506                       | 0.589             |
| -2.623   | 0.000    | 0.269    | 0.509                  | 14.75               | 1.7988                       | 0.272             |
| -4.096   | 0.000    | 1.323    | 0.974                  | 29.29               | 0.9054                       | 0.147             |
| -4.364   | 0.000    | 2.323    | 1.671                  | 58.62               | 0.4522                       | 0.100             |
| -4.005   | 0.000    | 3.152    | 2.493                  | 117.18              | 0.2262                       | 0.090             |
| -2.452   | 0.000    | 4.587    | 3.365                  | 232.66              | 0.1139                       | 0.098             |
| 1.244    | 0.000    | 7.098    | 4.623                  | 464.95              | 0.0570                       | 0.104             |
| 7.681    | 0.000    | 10.582   | 6.500                  | 929.26              | 0.0285                       | 0.105             |
| 18.616   | 0.000    | 15.362   | 9.209                  | 1857.14             | 0.0143                       | 0.105             |
| 37.066   | 0.000    | 21.953   | 13.073                 | 3711.39             | 0.0071                       | 0.104             |
| 61.617   | 0.000    | 29.317   | 17.484                 | 6593.27             | 0.0040                       | 0.103             |

NUMBER OF STEPS = 1281  
SURFACE LAYER (CENTER) LEVEL = 18.35 M ABOVE DISCHARGE PORT  
AVG DILUTION = 2614.45

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 6585.55

## SIMULACIÓN 21

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 1 JETLAG 2000  
TITLE Jet1

### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

### ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

Total Q ... 0.0200 (m3/s) Qj ... 2.00E-02 (m3/s)

|              |               |           |                  |
|--------------|---------------|-----------|------------------|
| Port No. ... | 1             | Mj ...    | 1.41E-01 (m4/s2) |
| Depth ...    | 29.3000 (m)   | Bj ...    | 5.17E-03 (m4/s3) |
| Diameter ... | 0.0600 (m)    | lQ ...    | 0.0532 (m)       |
| Uj ...       | 7.0736 (m/s)  | lm ...    | 3.7613 (m)       |
| Ua ...       | 0.1000 (m/s)  | lb ...    | 5.1688 (m)       |
| dp/pa ...    | 0.02635       | lM ...    | 3.2085 (m)       |
| po ...       | 0.99916(g/cc) | Sm ...    | 70.7355          |
| pa ...       | 1.02621(g/cc) | Sb ...    | 133.5837         |
| Ver. ang ... | 0.00          | lQ/lm ... | 0.0141           |
| Hor. ang ... | 90.00         | lQ/lM ... | 0.0166           |
| Fd ...       | 56.80         | lm/lb ... | 0.7277           |
| Uj/Ua ...    | 70.74         | lM/lb ... | 0.6207           |

| X      | Y      | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|--------|--------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)    | (m)    | (m)    | (m)             |                     |                              |                   |
| 0.000  | 0.000  | 0.000  | 0.030           | 1.00                | 27.0447                      | 7.074             |
| 0.001  | 0.177  | 0.000  | 0.059           | 1.98                | 13.5224                      | 3.574             |
| 0.011  | 0.537  | 0.001  | 0.117           | 3.88                | 6.8830                       | 1.801             |
| 0.061  | 1.264  | 0.013  | 0.232           | 7.67                | 3.4650                       | 0.908             |
| 0.229  | 2.395  | 0.080  | 0.457           | 15.26               | 1.7390                       | 0.465             |
| 0.646  | 3.762  | 0.309  | 0.874           | 30.43               | 0.8714                       | 0.253             |
| 1.509  | 5.149  | 0.865  | 1.535           | 60.74               | 0.4364                       | 0.164             |
| 3.252  | 6.537  | 2.071  | 2.401           | 121.29              | 0.2185                       | 0.134             |
| 6.426  | 7.810  | 4.298  | 3.526           | 242.37              | 0.1093                       | 0.124             |
| 11.411 | 8.809  | 7.513  | 5.124           | 484.51              | 0.0547                       | 0.117             |
| 19.258 | 9.594  | 11.845 | 7.411           | 968.43              | 0.0274                       | 0.112             |
| 31.952 | 10.228 | 17.674 | 10.658          | 1935.46             | 0.0137                       | 0.108             |
| 52.859 | 10.750 | 25.605 | 15.253          | 3867.86             | 0.0068                       | 0.106             |
| 64.028 | 10.924 | 29.342 | 17.460          | 5031.85             | 0.0053                       | 0.105             |

NUMBER OF STEPS = 1236

SURFACE LAYER (CENTER) LEVEL = 18.29 M ABOVE DISCHARGE PORT  
AVG DILUTION = 2059.91

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 5017.96

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 2 JETLAG 2000  
TITLE Jet2

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|              |               |        |                  |
|--------------|---------------|--------|------------------|
| Total Q ...  | 0.0200 (m3/s) | Qj ... | 2.00E-02 (m3/s)  |
| Port No. ... | 1             | Mj ... | 1.41E-01 (m4/s2) |
| Depth ...    | 29.3000 (m)   | Bj ... | 5.17E-03 (m4/s3) |
| Diameter ... | 0.0600 (m)    | lQ ... | 0.0532 (m)       |
| Uj ...       | 7.0736 (m/s)  | lm ... | 3.7613 (m)       |
| Ua ...       | 0.1000 (m/s)  | lb ... | 5.1688 (m)       |

|          |     |               |       |     |            |
|----------|-----|---------------|-------|-----|------------|
| dp/pa    | ... | 0.02635       | lM    | ... | 3.2085 (m) |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 70.7355    |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 133.5837   |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0141     |
| Hor. ang | ... | 180.00        | lQ/lm | ... | 0.0166     |
| Fd       | ... | 56.80         | lm/lb | ... | 0.7277     |
| Uj/Ua    | ... | 70.74         | lm/lb | ... | 0.6207     |

| X      | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|--------|-------|--------|-----------------|---------------------|------------------------------|----------|
| (m)    | (m)   | (m)    | (m)             |                     |                              | (m/s)    |
| 0.000  | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 7.074    |
| -0.176 | 0.000 | 0.000  | 0.060           | 1.98                | 13.5224                      | 3.524    |
| -0.531 | 0.000 | 0.001  | 0.120           | 3.89                | 6.8601                       | 1.719    |
| -1.242 | 0.000 | 0.015  | 0.246           | 7.70                | 3.4502                       | 0.813    |
| -2.648 | 0.000 | 0.141  | 0.518           | 15.30               | 1.7344                       | 0.363    |
| -4.949 | 0.000 | 1.130  | 1.006           | 29.23               | 0.9071                       | 0.184    |
| -5.846 | 0.000 | 2.605  | 1.804           | 58.51               | 0.4530                       | 0.114    |
| -5.672 | 0.000 | 3.747  | 2.857           | 117.06              | 0.2264                       | 0.091    |
| -4.463 | 0.000 | 5.158  | 3.959           | 232.50              | 0.1140                       | 0.094    |
| -0.788 | 0.000 | 7.930  | 5.375           | 464.51              | 0.0570                       | 0.102    |
| 6.078  | 0.000 | 12.009 | 7.507           | 928.45              | 0.0285                       | 0.105    |
| 17.784 | 0.000 | 17.593 | 10.614          | 1855.58             | 0.0143                       | 0.105    |
| 37.580 | 0.000 | 25.276 | 15.061          | 3708.30             | 0.0071                       | 0.104    |
| 49.507 | 0.000 | 29.321 | 17.450          | 4959.76             | 0.0053                       | 0.104    |

NUMBER OF STEPS = 1240  
 SURFACE LAYER (CENTER) LEVEL = 18.29 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 1995.66

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 4952.86

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 3 JETLAG 2000  
 TITLE Jet3

INPUT PARAMETERS  
 ^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^  

|         |          |       |       |        |        |
|---------|----------|-------|-------|--------|--------|
|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^  

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.17E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 3.7613 (m)       |
| Ua       | ... | 0.1000 (m/s)  | lb    | ... | 5.1688 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 3.2085 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 70.7355          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 133.5837         |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0141           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0166           |



Fd ... 56.80                      1m/1b ... 0.7277  
 Uj/Ua ... 70.74                    1m/1b ... 0.6207  
  
 Coflowing case:  
 dmj ... 0.1395  
 1m\* ... 3.7346  
 Sm\* ... 69.7355

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 7.074             |
| 0.179    | 0.000    | 0.000    | 0.059                  | 1.98                | 13.5224                      | 3.623             |
| 0.539    | 0.000    | 0.001    | 0.115                  | 3.89                | 6.8582                       | 1.867             |
| 1.261    | 0.000    | 0.012    | 0.223                  | 7.71                | 3.4479                       | 0.987             |
| 2.698    | 0.000    | 0.088    | 0.422                  | 15.32               | 1.7321                       | 0.547             |
| 5.336    | 0.000    | 0.511    | 0.765                  | 30.53               | 0.8685                       | 0.332             |
| 8.431    | 0.000    | 1.546    | 1.301                  | 61.01               | 0.4345                       | 0.229             |
| 11.625   | 0.000    | 3.081    | 2.102                  | 121.96              | 0.2173                       | 0.176             |
| 15.524   | 0.000    | 5.197    | 3.264                  | 243.82              | 0.1087                       | 0.146             |
| 20.799   | 0.000    | 7.993    | 4.927                  | 487.40              | 0.0544                       | 0.128             |
| 28.622   | 0.000    | 11.706   | 7.279                  | 974.13              | 0.0272                       | 0.117             |
| 40.994   | 0.000    | 16.754   | 10.584                 | 1946.64             | 0.0136                       | 0.111             |
| 61.249   | 0.000    | 23.746   | 15.228                 | 3889.87             | 0.0068                       | 0.107             |
| 79.716   | 0.000    | 29.321   | 18.947                 | 5933.74             | 0.0045                       | 0.105             |

NUMBER OF STEPS = 1259  
 SURFACE LAYER (CENTER) LEVEL = 17.93 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 2226.35

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 5925.27

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 4 ..... JETLAG 2000  
 TITLE Jet4

INPUT PARAMETERS  
 ^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^  

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0200 (m3/s) | Qj    | ... 2.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 1.41E-01 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 5.17E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 7.0736 (m/s)  | lm    | ... 3.7613 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb    | ... 5.1688 (m)       |
| dp/pa    | ... 0.02635       | lM    | ... 3.2085 (m)       |
| po       | ... 0.99916(g/cc) | Sm    | ... 70.7355          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 133.5837         |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0141           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0166           |

Fd ... 56.80 1m/lb ... 0.7277  
Uj/Ua ... 70.74 1m/lb ... 0.6207

Coflowing case:  
dmj ... 0.1395  
1m\* ... 3.7346  
Sm\* ... 69.7355

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 7.074             |
| -0.176   | 0.000    | 0.000    | 0.060                  | 1.98                | 13.5224                      | 3.524             |
| -0.531   | 0.000    | 0.001    | 0.120                  | 3.89                | 6.8601                       | 1.719             |
| -1.242   | 0.000    | 0.015    | 0.246                  | 7.70                | 3.4502                       | 0.813             |
| -2.648   | 0.000    | 0.141    | 0.518                  | 15.30               | 1.7344                       | 0.363             |
| -4.949   | 0.000    | 1.130    | 1.006                  | 29.23               | 0.9071                       | 0.184             |
| -5.846   | 0.000    | 2.605    | 1.804                  | 58.51               | 0.4530                       | 0.114             |
| -5.672   | 0.000    | 3.747    | 2.857                  | 117.06              | 0.2264                       | 0.091             |
| -4.463   | 0.000    | 5.158    | 3.959                  | 232.50              | 0.1140                       | 0.094             |
| -0.788   | 0.000    | 7.930    | 5.375                  | 464.51              | 0.0570                       | 0.102             |
| 6.078    | 0.000    | 12.009   | 7.507                  | 928.45              | 0.0285                       | 0.105             |
| 17.784   | 0.000    | 17.593   | 10.614                 | 1855.58             | 0.0143                       | 0.105             |
| 37.580   | 0.000    | 25.276   | 15.061                 | 3708.30             | 0.0071                       | 0.104             |
| 49.507   | 0.000    | 29.321   | 17.450                 | 4959.76             | 0.0053                       | 0.104             |

NUMBER OF STEPS = 1240  
SURFACE LAYER (CENTER) LEVEL = 18.29 M ABOVE DISCHARGE PORT  
AVG DILUTION = 1995.66

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 4952.86

1  
ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
CASE NO. 5 JETLAG 2000  
TITLE Jet5

INPUT PARAMETERS  
AAAAAAAAAAAAAAAAAAAA  
ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
AAAAAAAAAAAAAAAAAAAA  
EXIT DEPTH(m) S T(C) SIGMAT U(m/s)  
29.30 0.00 15.00 -0.84 7.074  
AMBIENT 0.00 35.00 14.00 26.21 0.100  
30.00 35.00 14.00 26.21 0.100

LENGTH & DILUTION SCALES  
AAAAAAAAAAAAAAAAAAAA  
Total Q ... 0.0200 (m3/s) Qj ... 2.00E-02 (m3/s)  
Port No. ... 1 Mj ... 1.41E-01 (m4/s2)  
Depth ... 29.3000 (m) Bj ... 5.17E-03 (m4/s3)  
Diameter ... 0.0600 (m) lQ ... 0.0532 (m)  
Uj ... 7.0736 (m/s) lm ... 3.7613 (m)  
Ua ... 0.1000 (m/s) lb ... 5.1688 (m)  
dp/pa ... 0.02635 lM ... 3.2085 (m)  
po ... 0.99916(g/cc) Sm ... 70.7355  
pa ... 1.02621(g/cc) Sb ... 133.5837  
Ver. ang ... 0.00 lQ/lm ... 0.0141  
Hor. ang ... 0.00 lQ/lM ... 0.0166

Fd ... 56.80                      1m/1b ... 0.7277  
 Uj/Ua ... 70.74                    1m/1b ... 0.6207  
  
 Coflowing case:  
 dmj ... 0.1395  
 1m\* ... 3.7346  
 Sm\* ... 69.7355

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 7.074             |
| 0.179    | 0.000    | 0.000    | 0.059                  | 1.98                | 13.5224                      | 3.623             |
| 0.539    | 0.000    | 0.001    | 0.115                  | 3.89                | 6.8582                       | 1.867             |
| 1.261    | 0.000    | 0.012    | 0.223                  | 7.71                | 3.4479                       | 0.987             |
| 2.698    | 0.000    | 0.088    | 0.422                  | 15.32               | 1.7321                       | 0.547             |
| 5.336    | 0.000    | 0.511    | 0.765                  | 30.53               | 0.8685                       | 0.332             |
| 8.431    | 0.000    | 1.546    | 1.301                  | 61.01               | 0.4345                       | 0.229             |
| 11.625   | 0.000    | 3.081    | 2.102                  | 121.96              | 0.2173                       | 0.176             |
| 15.524   | 0.000    | 5.197    | 3.264                  | 243.82              | 0.1087                       | 0.146             |
| 20.799   | 0.000    | 7.993    | 4.927                  | 487.40              | 0.0544                       | 0.128             |
| 28.622   | 0.000    | 11.706   | 7.279                  | 974.13              | 0.0272                       | 0.117             |
| 40.994   | 0.000    | 16.754   | 10.584                 | 1946.64             | 0.0136                       | 0.111             |
| 61.249   | 0.000    | 23.746   | 15.228                 | 3889.87             | 0.0068                       | 0.107             |
| 79.716   | 0.000    | 29.321   | 18.947                 | 5933.74             | 0.0045                       | 0.105             |

NUMBER OF STEPS = 1259  
 SURFACE LAYER (CENTER) LEVEL = 17.93 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 2226.35

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 5925.27

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 6 JETLAG 2000  
 TITLE Jet6

INPUT PARAMETERS  
 ^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^  

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0200 (m3/s) | Qj    | ... 2.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 1.41E-01 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 5.17E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 7.0736 (m/s)  | lm    | ... 3.7613 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb    | ... 5.1688 (m)       |
| dp/pa    | ... 0.02635       | lM    | ... 3.2085 (m)       |
| po       | ... 0.99916(g/cc) | Sm    | ... 70.7355          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 133.5837         |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0141           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0166           |

Fd ... 56.80 1m/lb ... 0.7277  
Uj/Ua ... 70.74 1m/lb ... 0.6207

Coflowing case:  
dmj ... 0.1395  
1m\* ... 3.7346  
Sm\* ... 69.7355

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 7.074             |
| -0.176   | 0.000    | 0.000    | 0.060                  | 1.98                | 13.5224                      | 3.524             |
| -0.531   | 0.000    | 0.001    | 0.120                  | 3.89                | 6.8601                       | 1.719             |
| -1.242   | 0.000    | 0.015    | 0.246                  | 7.70                | 3.4502                       | 0.813             |
| -2.648   | 0.000    | 0.141    | 0.518                  | 15.30               | 1.7344                       | 0.363             |
| -4.949   | 0.000    | 1.130    | 1.006                  | 29.23               | 0.9071                       | 0.184             |
| -5.846   | 0.000    | 2.605    | 1.804                  | 58.51               | 0.4530                       | 0.114             |
| -5.672   | 0.000    | 3.747    | 2.857                  | 117.06              | 0.2264                       | 0.091             |
| -4.463   | 0.000    | 5.158    | 3.959                  | 232.50              | 0.1140                       | 0.094             |
| -0.788   | 0.000    | 7.930    | 5.375                  | 464.51              | 0.0570                       | 0.102             |
| 6.078    | 0.000    | 12.009   | 7.507                  | 928.45              | 0.0285                       | 0.105             |
| 17.784   | 0.000    | 17.593   | 10.614                 | 1855.58             | 0.0143                       | 0.105             |
| 37.580   | 0.000    | 25.276   | 15.061                 | 3708.30             | 0.0071                       | 0.104             |
| 49.507   | 0.000    | 29.321   | 17.450                 | 4959.76             | 0.0053                       | 0.104             |

NUMBER OF STEPS = 1240  
SURFACE LAYER (CENTER) LEVEL = 18.29 M ABOVE DISCHARGE PORT  
AVG DILUTION = 1995.66

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 4952.86

1  
ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
.....  
CASE NO. 7 JETLAG 2000  
TITLE Jet7

INPUT PARAMETERS  
^^  
ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
^^  
DEPTH(m) S T(C) SIGMAT U(m/s)  
EXIT 29.30 0.00 15.00 -0.84 7.074  
.....  
AMBIENT 0.00 35.00 14.00 26.21 0.100  
30.00 35.00 14.00 26.21 0.100

LENGTH & DILUTION SCALES  
^^  
Total Q ... 0.0200 (m3/s) Qj ... 2.00E-02 (m3/s)  
Port No. ... 1 Mj ... 1.41E-01 (m4/s2)  
Depth ... 29.3000 (m) Bj ... 5.17E-03 (m4/s3)  
Diameter ... 0.0600 (m) lQ ... 0.0532 (m)  
Uj ... 7.0736 (m/s) lm ... 3.7613 (m)  
Ua ... 0.1000 (m/s) lb ... 5.1688 (m)  
dp/pa ... 0.02635 lM ... 3.2085 (m)  
po ... 0.99916(g/cc) Sm ... 70.7355  
pa ... 1.02621(g/cc) Sb ... 133.5837  
Ver. ang ... 0.00 lQ/lm ... 0.0141  
Hor. ang ... 0.00 lQ/lM ... 0.0166

Fd ... 56.80                      1m/1b ... 0.7277  
 Uj/Ua ... 70.74                    1m/1b ... 0.6207  
  
 Coflowing case:  
 dmj ... 0.1395  
 1m\* ... 3.7346  
 Sm\* ... 69.7355

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 7.074             |
| 0.179    | 0.000    | 0.000    | 0.059                  | 1.98                | 13.5224                      | 3.623             |
| 0.539    | 0.000    | 0.001    | 0.115                  | 3.89                | 6.8582                       | 1.867             |
| 1.261    | 0.000    | 0.012    | 0.223                  | 7.71                | 3.4479                       | 0.987             |
| 2.698    | 0.000    | 0.088    | 0.422                  | 15.32               | 1.7321                       | 0.547             |
| 5.336    | 0.000    | 0.511    | 0.765                  | 30.53               | 0.8685                       | 0.332             |
| 8.431    | 0.000    | 1.546    | 1.301                  | 61.01               | 0.4345                       | 0.229             |
| 11.625   | 0.000    | 3.081    | 2.102                  | 121.96              | 0.2173                       | 0.176             |
| 15.524   | 0.000    | 5.197    | 3.264                  | 243.82              | 0.1087                       | 0.146             |
| 20.799   | 0.000    | 7.993    | 4.927                  | 487.40              | 0.0544                       | 0.128             |
| 28.622   | 0.000    | 11.706   | 7.279                  | 974.13              | 0.0272                       | 0.117             |
| 40.994   | 0.000    | 16.754   | 10.584                 | 1946.64             | 0.0136                       | 0.111             |
| 61.249   | 0.000    | 23.746   | 15.228                 | 3889.87             | 0.0068                       | 0.107             |
| 79.716   | 0.000    | 29.321   | 18.947                 | 5933.74             | 0.0045                       | 0.105             |

NUMBER OF STEPS = 1259  
 SURFACE LAYER (CENTER) LEVEL = 17.93 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 2226.35

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 5925.27

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 8 JETLAG 2000  
 TITLE Jet8

INPUT PARAMETERS  
 ^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.100  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.100  |

LENGTH & DILUTION SCALES  
 ^^^  

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0200 (m3/s) | Qj    | ... 2.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 1.41E-01 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 5.17E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 7.0736 (m/s)  | lm    | ... 3.7613 (m)       |
| Ua       | ... 0.1000 (m/s)  | lb    | ... 5.1688 (m)       |
| dp/pa    | ... 0.02635       | lM    | ... 3.2085 (m)       |
| po       | ... 0.99916(g/cc) | Sm    | ... 70.7355          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 133.5837         |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0141           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0166           |

Fd ... 56.80                      1m/1b ... 0.7277  
Uj/Ua ... 70.74                    1m/1b ... 0.6207

Coflowing case:  
dmj ... 0.1395  
1m\* ... 3.7346  
Sm\* ... 69.7355

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 7.074             |
| -0.176   | 0.000    | 0.000    | 0.060                  | 1.98                | 13.5224                      | 3.524             |
| -0.531   | 0.000    | 0.001    | 0.120                  | 3.89                | 6.8601                       | 1.719             |
| -1.242   | 0.000    | 0.015    | 0.246                  | 7.70                | 3.4502                       | 0.813             |
| -2.648   | 0.000    | 0.141    | 0.518                  | 15.30               | 1.7344                       | 0.363             |
| -4.949   | 0.000    | 1.130    | 1.006                  | 29.23               | 0.9071                       | 0.184             |
| -5.846   | 0.000    | 2.605    | 1.804                  | 58.51               | 0.4530                       | 0.114             |
| -5.672   | 0.000    | 3.747    | 2.857                  | 117.06              | 0.2264                       | 0.091             |
| -4.463   | 0.000    | 5.158    | 3.959                  | 232.50              | 0.1140                       | 0.094             |
| -0.788   | 0.000    | 7.930    | 5.375                  | 464.51              | 0.0570                       | 0.102             |
| 6.078    | 0.000    | 12.009   | 7.507                  | 928.45              | 0.0285                       | 0.105             |
| 17.784   | 0.000    | 17.593   | 10.614                 | 1855.58             | 0.0143                       | 0.105             |
| 37.580   | 0.000    | 25.276   | 15.061                 | 3708.30             | 0.0071                       | 0.104             |
| 49.507   | 0.000    | 29.321   | 17.450                 | 4959.76             | 0.0053                       | 0.104             |

NUMBER OF STEPS = 1240  
SURFACE LAYER (CENTER) LEVEL = 18.29 M ABOVE DISCHARGE PORT  
AVG DILUTION = 1995.66

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 4952.86

1  
ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
.....  
CASE NO. 9 JETLAG 2000  
TITLE Jet9

INPUT PARAMETERS  
^^^^^^^^^^^^^^^^^^^^  
ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
^^^^^^^^^^^^^^^^^^^^  
          DEPTH(m)      S      T(C)      SIGMAT      U(m/s)  
EXIT      29.30      0.00     15.00     -0.84      7.074  
.....  
AMBIENT      0.00     35.00     14.00     26.21      0.100  
          30.00     35.00     14.00     26.21      0.100

LENGTH & DILUTION SCALES  
^^^^^^^^^^^^^^^^^^^^  
Total Q ... 0.0200 (m3/s)                      Qj ... 2.00E-02 (m3/s)  
Port No. ... 1                                    Mj ... 1.41E-01 (m4/s2)  
Depth ... 29.3000 (m)                            Bj ... 5.17E-03 (m4/s3)  
Diameter ... 0.0600 (m)                            lQ ... 0.0532 (m)  
Uj ... 7.0736 (m/s)                                lm ... 3.7613 (m)  
Ua ... 0.1000 (m/s)                                lb ... 5.1688 (m)  
dp/pa ... 0.02635                                 lM ... 3.2085 (m)  
po ... 0.99916(g/cc)                                Sm ... 70.7355  
pa ... 1.02621(g/cc)                                Sb ... 133.5837  
Ver. ang ... 0.00                                 lQ/lm ... 0.0141  
Hor. ang ... 0.00                                 lQ/lM ... 0.0166

Fd ... 56.80                      1m/1b ... 0.7277  
Uj/Ua ... 70.74                    1m/1b ... 0.6207

Coflowing case:  
dmj ... 0.1395  
1m\* ... 3.7346  
Sm\* ... 69.7355

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 7.074             |
| 0.179    | 0.000    | 0.000    | 0.059                  | 1.98                | 13.5224                      | 3.623             |
| 0.539    | 0.000    | 0.001    | 0.115                  | 3.89                | 6.8582                       | 1.867             |
| 1.261    | 0.000    | 0.012    | 0.223                  | 7.71                | 3.4479                       | 0.987             |
| 2.698    | 0.000    | 0.088    | 0.422                  | 15.32               | 1.7321                       | 0.547             |
| 5.336    | 0.000    | 0.511    | 0.765                  | 30.53               | 0.8685                       | 0.332             |
| 8.431    | 0.000    | 1.546    | 1.301                  | 61.01               | 0.4345                       | 0.229             |
| 11.625   | 0.000    | 3.081    | 2.102                  | 121.96              | 0.2173                       | 0.176             |
| 15.524   | 0.000    | 5.197    | 3.264                  | 243.82              | 0.1087                       | 0.146             |
| 20.799   | 0.000    | 7.993    | 4.927                  | 487.40              | 0.0544                       | 0.128             |
| 28.622   | 0.000    | 11.706   | 7.279                  | 974.13              | 0.0272                       | 0.117             |
| 40.994   | 0.000    | 16.754   | 10.584                 | 1946.64             | 0.0136                       | 0.111             |
| 61.249   | 0.000    | 23.746   | 15.228                 | 3889.87             | 0.0068                       | 0.107             |
| 79.716   | 0.000    | 29.321   | 18.947                 | 5933.74             | 0.0045                       | 0.105             |

NUMBER OF STEPS = 1259  
SURFACE LAYER (CENTER) LEVEL = 17.93 M ABOVE DISCHARGE PORT  
AVG DILUTION = 2226.35

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 5925.27

1  
ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
.....  
CASE NO. 10  
TITLE Jet10 JETLAG 2000

INPUT PARAMETERS  
^^^^^^^^^^^^^^^^^^^^  
ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
^^^^^^^^^^^^^^^^^^^^  
EXIT DEPTH(m) S T(C) SIGMAT U(m/s)  
29.30 0.00 15.00 -0.84 7.074  
.....  
AMBIENT 0.00 35.00 14.00 26.21 0.100  
30.00 35.00 14.00 26.21 0.100

LENGTH & DILUTION SCALES  
^^^^^^^^^^^^^^^^^^^^  
Total Q ... 0.0200 (m3/s) Qj ... 2.00E-02 (m3/s)  
Port No. ... 1 Mj ... 1.41E-01 (m4/s2)  
Depth ... 29.3000 (m) Bj ... 5.17E-03 (m4/s3)  
Diameter ... 0.0600 (m) lQ ... 0.0532 (m)  
Uj ... 7.0736 (m/s) lm ... 3.7613 (m)  
Ua ... 0.1000 (m/s) lb ... 5.1688 (m)  
dp/pa ... 0.02635 lm ... 3.2085 (m)  
po ... 0.99916(g/cc) Sm ... 70.7355  
pa ... 1.02621(g/cc) Sb ... 133.5837  
Ver. ang ... 0.00 1Q/lm ... 0.0141

Hor. ang ... 180.00      lq/lm ... 0.0166  
 Fd ... 56.80      lm/lb ... 0.7277  
 Uj/Ua ... 70.74      lm/lb ... 0.6207

Coflowing case:  
 dmj ... 0.1395  
 lm\* ... 3.7346  
 sm\* ... 69.7355

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 7.074             |
| -0.176   | 0.000    | 0.000    | 0.060                  | 1.98                | 13.5224                      | 3.524             |
| -0.531   | 0.000    | 0.001    | 0.120                  | 3.89                | 6.8601                       | 1.719             |
| -1.242   | 0.000    | 0.015    | 0.246                  | 7.70                | 3.4502                       | 0.813             |
| -2.648   | 0.000    | 0.141    | 0.518                  | 15.30               | 1.7344                       | 0.363             |
| -4.949   | 0.000    | 1.130    | 1.006                  | 29.23               | 0.9071                       | 0.184             |
| -5.846   | 0.000    | 2.605    | 1.804                  | 58.51               | 0.4530                       | 0.114             |
| -5.672   | 0.000    | 3.747    | 2.857                  | 117.06              | 0.2264                       | 0.091             |
| -4.463   | 0.000    | 5.158    | 3.959                  | 232.50              | 0.1140                       | 0.094             |
| -0.788   | 0.000    | 7.930    | 5.375                  | 464.51              | 0.0570                       | 0.102             |
| 6.078    | 0.000    | 12.009   | 7.507                  | 928.45              | 0.0285                       | 0.105             |
| 17.784   | 0.000    | 17.593   | 10.614                 | 1855.58             | 0.0143                       | 0.105             |
| 37.580   | 0.000    | 25.276   | 15.061                 | 3708.30             | 0.0071                       | 0.104             |
| 49.507   | 0.000    | 29.321   | 17.450                 | 4959.76             | 0.0053                       | 0.104             |

NUMBER OF STEPS = 1240  
 SURFACE LAYER (CENTER) LEVEL = 18.29 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 1995.66

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 4952.86

## **SIMULACIÓN 22**

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 1 JETLAG 2000  
 TITLE Jet1

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^  

|          |                   |    |                      |
|----------|-------------------|----|----------------------|
| Total Q  | ... 0.0100 (m3/s) | Qj | ... 1.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj | ... 3.54E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj | ... 2.58E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lq | ... 0.0532 (m)       |
| Uj       | ... 3.5368 (m/s)  | lm | ... 0.9403 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb | ... 0.3231 (m)       |



|          |     |               |       |     |            |
|----------|-----|---------------|-------|-----|------------|
| dp/pa    | ... | 0.02635       | lM    | ... | 1.6043 (m) |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 17.6839    |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 2.0872     |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0565     |
| Hor. ang | ... | 90.00         | lQ/lm | ... | 0.0331     |
| Fd       | ... | 28.40         | lm/lb | ... | 2.9107     |
| Uj/Ua    | ... | 17.68         | lm/lb | ... | 4.9660     |

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|---------|-------|--------|-----------------|---------------------|------------------------------|----------|
| (m)     | (m)   | (m)    | (m)             |                     |                              | (m/s)    |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 3.537    |
| 0.005   | 0.182 | 0.000  | 0.059           | 1.98                | 13.5224                      | 1.789    |
| 0.036   | 0.467 | 0.004  | 0.117           | 3.90                | 6.8477                       | 0.908    |
| 0.129   | 0.816 | 0.018  | 0.226           | 7.74                | 3.4356                       | 0.482    |
| 0.336   | 1.170 | 0.053  | 0.408           | 15.41               | 1.7221                       | 0.294    |
| 0.736   | 1.495 | 0.123  | 0.657           | 30.71               | 0.8634                       | 0.226    |
| 1.742   | 1.889 | 0.309  | 0.967           | 61.17               | 0.4333                       | 0.208    |
| 4.021   | 2.341 | 0.785  | 1.377           | 122.09              | 0.2171                       | 0.205    |
| 7.977   | 2.735 | 1.641  | 1.951           | 243.96              | 0.1086                       | 0.204    |
| 14.381  | 3.053 | 2.925  | 2.763           | 487.56              | 0.0543                       | 0.203    |
| 24.862  | 3.313 | 4.759  | 3.914           | 974.33              | 0.0272                       | 0.202    |
| 42.240  | 3.528 | 7.352  | 5.542           | 1947.04             | 0.0136                       | 0.202    |
| 71.260  | 3.708 | 11.008 | 7.844           | 3890.75             | 0.0068                       | 0.201    |
| 119.883 | 3.859 | 16.162 | 11.098          | 7774.80             | 0.0034                       | 0.201    |
| 201.485 | 3.985 | 23.432 | 15.699          | 15536.08            | 0.0017                       | 0.201    |
| 277.950 | 4.054 | 29.372 | 19.463          | 23864.06            | 0.0011                       | 0.201    |

NUMBER OF STEPS = 1460  
 SURFACE LAYER (CENTER) LEVEL = 17.41 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 8918.68

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 23752.18

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 2 JETLAG 2000  
 TITLE Jet2

INPUT PARAMETERS  
 ^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^  

|         |          |       |       |        |        |
|---------|----------|-------|-------|--------|--------|
|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^  

|          |     |               |    |     |                  |
|----------|-----|---------------|----|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj | ... | 2.58E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm | ... | 0.9403 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb | ... | 0.3231 (m)       |
| dp/pa    | ... | 0.02635       | lM | ... | 1.6043 (m)       |
| po       | ... | 0.99916(g/cc) | Sm | ... | 17.6839          |
| pa       | ... | 1.02621(g/cc) | Sb | ... | 2.0872           |

Ver. ang ... 0.00                      lQ/lm ... 0.0565  
 Hor. ang ... 180.00                  lQ/lm ... 0.0331  
 Fd ... 28.40                        lm/lb ... 2.9107  
 Uj/Ua ... 17.68                    lM/lb ... 4.9660

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 3.537             |
| -0.173   | 0.000    | 0.000    | 0.061                  | 1.98                | 13.5224                      | 1.688             |
| -0.521   | 0.000    | 0.006    | 0.128                  | 3.89                | 6.8716                       | 0.749             |
| -1.184   | 0.000    | 0.078    | 0.266                  | 7.13                | 3.7278                       | 0.321             |
| -1.968   | 0.000    | 0.514    | 0.561                  | 13.48               | 1.9683                       | 0.136             |
| -1.968   | 0.000    | 0.772    | 0.919                  | 27.98               | 0.9477                       | 0.105             |
| -1.461   | 0.000    | 1.077    | 1.086                  | 54.32               | 0.4879                       | 0.147             |
| 0.074    | 0.000    | 1.658    | 1.404                  | 108.48              | 0.2443                       | 0.175             |
| 3.044    | 0.000    | 2.505    | 1.910                  | 216.71              | 0.1223                       | 0.189             |
| 8.347    | 0.000    | 3.719    | 2.654                  | 432.97              | 0.0612                       | 0.196             |
| 17.499   | 0.000    | 5.443    | 3.723                  | 865.11              | 0.0306                       | 0.199             |
| 33.061   | 0.000    | 7.879    | 5.246                  | 1728.68             | 0.0153                       | 0.200             |
| 59.353   | 0.000    | 11.317   | 7.408                  | 3454.35             | 0.0077                       | 0.200             |
| 103.636  | 0.000    | 16.169   | 10.469                 | 6902.69             | 0.0038                       | 0.200             |
| 178.127  | 0.000    | 23.017   | 14.800                 | 13793.39            | 0.0019                       | 0.200             |
| 257.388  | 0.000    | 29.323   | 18.795                 | 22239.29            | 0.0012                       | 0.200             |

NUMBER OF STEPS = 1467

SURFACE LAYER (CENTER) LEVEL = 17.80 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 8328.89

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 22204.40

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 3 JETLAG 2000  
 TITLE Jet3

#### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

#### ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

#### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|              |               |           |                  |
|--------------|---------------|-----------|------------------|
| Total Q ...  | 0.0100 (m3/s) | Qj ...    | 1.00E-02 (m3/s)  |
| Port No. ... | 1             | Mj ...    | 3.54E-02 (m4/s2) |
| Depth ...    | 29.3000 (m)   | Bj ...    | 2.58E-03 (m4/s3) |
| Diameter ... | 0.0600 (m)    | lQ ...    | 0.0532 (m)       |
| Uj ...       | 3.5368 (m/s)  | lm ...    | 0.9403 (m)       |
| Ua ...       | 0.2000 (m/s)  | lb ...    | 0.3231 (m)       |
| dp/pa ...    | 0.02635       | lM ...    | 1.6043 (m)       |
| po ...       | 0.99916(g/cc) | Sm ...    | 17.6839          |
| pa ...       | 1.02621(g/cc) | Sb ...    | 2.0872           |
| Ver. ang ... | 0.00          | lQ/lm ... | 0.0565           |
| Hor. ang ... | 0.00          | lQ/lm ... | 0.0331           |
| Fd ...       | 28.40         | lm/lb ... | 2.9107           |

Uj/Ua ... 17.68                      1m/lb ... 4.9660

Coflowing case:

dMj ... 0.0334  
1m\* ... 0.9133  
Sm\* ... 16.6839

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF. | VELOCITY |
|---------|-------|--------|-----------------|---------------------|------------------|----------|
| (m)     | (m)   | (m)    | (m)             |                     | (sigmat)         | (m/s)    |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447          | 3.537    |
| 0.183   | 0.000 | 0.000  | 0.058           | 1.98                | 13.5224          | 1.885    |
| 0.552   | 0.000 | 0.005  | 0.109           | 3.90                | 6.8556           | 1.046    |
| 1.296   | 0.000 | 0.038  | 0.198           | 7.72                | 3.4452           | 0.625    |
| 2.562   | 0.000 | 0.182  | 0.342           | 15.36               | 1.7270           | 0.417    |
| 4.019   | 0.000 | 0.460  | 0.558           | 30.68               | 0.8643           | 0.313    |
| 5.748   | 0.000 | 0.856  | 0.866           | 61.29               | 0.4324           | 0.260    |
| 8.183   | 0.000 | 1.418  | 1.296           | 122.43              | 0.2164           | 0.232    |
| 11.978  | 0.000 | 2.230  | 1.891           | 244.60              | 0.1083           | 0.218    |
| 18.133  | 0.000 | 3.403  | 2.722           | 488.72              | 0.0542           | 0.210    |
| 28.317  | 0.000 | 5.089  | 3.887           | 976.49              | 0.0271           | 0.206    |
| 45.327  | 0.000 | 7.506  | 5.526           | 1951.18             | 0.0136           | 0.203    |
| 73.864  | 0.000 | 10.961 | 7.836           | 3898.88             | 0.0068           | 0.202    |
| 121.829 | 0.000 | 15.887 | 11.099          | 7790.88             | 0.0034           | 0.201    |
| 202.516 | 0.000 | 22.896 | 15.707          | 15568.15            | 0.0017           | 0.201    |
| 288.430 | 0.000 | 29.388 | 19.955          | 25100.56            | 0.0011           | 0.201    |

NUMBER OF STEPS = 1467

SURFACE LAYER (CENTER) LEVEL = 17.28 M ABOVE DISCHARGE PORT

AVG DILUTION = 9129.61

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 24956.47

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 4 JETLAG 2000

TITLE Jet4

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0100 (m3/s) | Qj    | ... 1.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 3.54E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 2.58E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 3.5368 (m/s)  | lm    | ... 0.9403 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.3231 (m)       |
| dp/pa    | ... 0.02635       | lm    | ... 1.6043 (m)       |
| po       | ... 0.99916(g/cc) | Sm    | ... 17.6839          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 2.0872           |
| Ver. ang | ... 0.00          | 1Q/lm | ... 0.0565           |

Hor. ang ... 180.00      lQ/lM ... 0.0331  
 Fd ... 28.40      lm/lb ... 2.9107  
 Uj/Ua ... 17.68      lM/lb ... 4.9660

Coflowing case:  
 dMj ... 0.0334  
 lm\* ... 0.9133  
 sm\* ... 16.6839

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 3.537             |
| -0.173   | 0.000    | 0.000    | 0.061                  | 1.98                | 13.5224                      | 1.688             |
| -0.521   | 0.000    | 0.006    | 0.128                  | 3.89                | 6.8716                       | 0.749             |
| -1.184   | 0.000    | 0.078    | 0.266                  | 7.13                | 3.7278                       | 0.321             |
| -1.968   | 0.000    | 0.514    | 0.561                  | 13.48               | 1.9683                       | 0.136             |
| -1.968   | 0.000    | 0.772    | 0.919                  | 27.98               | 0.9477                       | 0.105             |
| -1.461   | 0.000    | 1.077    | 1.086                  | 54.32               | 0.4879                       | 0.147             |
| 0.074    | 0.000    | 1.658    | 1.404                  | 108.48              | 0.2443                       | 0.175             |
| 3.044    | 0.000    | 2.505    | 1.910                  | 216.71              | 0.1223                       | 0.189             |
| 8.347    | 0.000    | 3.719    | 2.654                  | 432.97              | 0.0612                       | 0.196             |
| 17.499   | 0.000    | 5.443    | 3.723                  | 865.11              | 0.0306                       | 0.199             |
| 33.061   | 0.000    | 7.879    | 5.246                  | 1728.68             | 0.0153                       | 0.200             |
| 59.353   | 0.000    | 11.317   | 7.408                  | 3454.35             | 0.0077                       | 0.200             |
| 103.636  | 0.000    | 16.169   | 10.469                 | 6902.69             | 0.0038                       | 0.200             |
| 178.127  | 0.000    | 23.017   | 14.800                 | 13793.39            | 0.0019                       | 0.200             |
| 257.388  | 0.000    | 29.323   | 18.795                 | 22239.29            | 0.0012                       | 0.200             |

NUMBER OF STEPS = 1467  
 SURFACE LAYER (CENTER) LEVEL = 17.80 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 8328.89

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 22204.40

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 5 JETLAG 2000  
 TITLE Jet5

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^  

|          |                   |    |                      |
|----------|-------------------|----|----------------------|
| Total Q  | ... 0.0100 (m3/s) | Qj | ... 1.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj | ... 3.54E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj | ... 2.58E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ | ... 0.0532 (m)       |
| Uj       | ... 3.5368 (m/s)  | lm | ... 0.9403 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb | ... 0.3231 (m)       |
| dp/pa    | ... 0.02635       | lM | ... 1.6043 (m)       |

```

po      ... 0.99916(g/cc)      Sm ... 17.6839
pa      ... 1.02621(g/cc)      Sb ... 2.0872
Ver. ang ... 0.00              lq/lm ... 0.0565
Hor. ang ... 0.00              lq/lM ... 0.0331
Fd      ... 28.40              lm/lb ... 2.9107
Uj/Ua   ... 17.68              lM/lb ... 4.9660

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Coflowing case:
dmj     ... 0.0334
lm*     ... 0.9133
Sm*     ... 16.6839

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| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 3.537             |
| 0.183    | 0.000    | 0.000    | 0.058                  | 1.98                | 13.5224                      | 1.885             |
| 0.552    | 0.000    | 0.005    | 0.109                  | 3.90                | 6.8556                       | 1.046             |
| 1.296    | 0.000    | 0.038    | 0.198                  | 7.72                | 3.4452                       | 0.625             |
| 2.562    | 0.000    | 0.182    | 0.342                  | 15.36               | 1.7270                       | 0.417             |
| 4.019    | 0.000    | 0.460    | 0.558                  | 30.68               | 0.8643                       | 0.313             |
| 5.748    | 0.000    | 0.856    | 0.866                  | 61.29               | 0.4324                       | 0.260             |
| 8.183    | 0.000    | 1.418    | 1.296                  | 122.43              | 0.2164                       | 0.232             |
| 11.978   | 0.000    | 2.230    | 1.891                  | 244.60              | 0.1083                       | 0.218             |
| 18.133   | 0.000    | 3.403    | 2.722                  | 488.72              | 0.0542                       | 0.210             |
| 28.317   | 0.000    | 5.089    | 3.887                  | 976.49              | 0.0271                       | 0.206             |
| 45.327   | 0.000    | 7.506    | 5.526                  | 1951.18             | 0.0136                       | 0.203             |
| 73.864   | 0.000    | 10.961   | 7.836                  | 3898.88             | 0.0068                       | 0.202             |
| 121.829  | 0.000    | 15.887   | 11.099                 | 7790.88             | 0.0034                       | 0.201             |
| 202.516  | 0.000    | 22.896   | 15.707                 | 15568.15            | 0.0017                       | 0.201             |
| 288.430  | 0.000    | 29.388   | 19.955                 | 25100.56            | 0.0011                       | 0.201             |

NUMBER OF STEPS = 1467  
 SURFACE LAYER (CENTER) LEVEL = 17.28 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 9129.61

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 24956.47

1 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 6 JETLAG 2000  
 TITLE Jet6

INPUT PARAMETERS  
 ^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^  

|          |                   |    |                      |
|----------|-------------------|----|----------------------|
| Total Q  | ... 0.0100 (m3/s) | Qj | ... 1.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj | ... 3.54E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj | ... 2.58E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lq | ... 0.0532 (m)       |

|          |     |               |       |     |            |
|----------|-----|---------------|-------|-----|------------|
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 0.9403 (m) |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.3231 (m) |
| dp/pa    | ... | 0.02635       | lM    | ... | 1.6043 (m) |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 17.6839    |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 2.0872     |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0565     |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0331     |
| Fd       | ... | 28.40         | lm/lb | ... | 2.9107     |
| Uj/Ua    | ... | 17.68         | lM/lb | ... | 4.9660     |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0334  |
| lm* | ... | 0.9133  |
| Sm* | ... | 16.6839 |

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF. | VELOCITY |
|---------|-------|--------|-----------------|---------------------|------------------|----------|
| (m)     | (m)   | (m)    | (m)             |                     | (sigmat)         | (m/s)    |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447          | 3.537    |
| -0.173  | 0.000 | 0.000  | 0.061           | 1.98                | 13.5224          | 1.688    |
| -0.521  | 0.000 | 0.006  | 0.128           | 3.89                | 6.8716           | 0.749    |
| -1.184  | 0.000 | 0.078  | 0.266           | 7.13                | 3.7278           | 0.321    |
| -1.968  | 0.000 | 0.514  | 0.561           | 13.48               | 1.9683           | 0.136    |
| -1.968  | 0.000 | 0.772  | 0.919           | 27.98               | 0.9477           | 0.105    |
| -1.461  | 0.000 | 1.077  | 1.086           | 54.32               | 0.4879           | 0.147    |
| 0.074   | 0.000 | 1.658  | 1.404           | 108.48              | 0.2443           | 0.175    |
| 3.044   | 0.000 | 2.505  | 1.910           | 216.71              | 0.1223           | 0.189    |
| 8.347   | 0.000 | 3.719  | 2.654           | 432.97              | 0.0612           | 0.196    |
| 17.499  | 0.000 | 5.443  | 3.723           | 865.11              | 0.0306           | 0.199    |
| 33.061  | 0.000 | 7.879  | 5.246           | 1728.68             | 0.0153           | 0.200    |
| 59.353  | 0.000 | 11.317 | 7.408           | 3454.35             | 0.0077           | 0.200    |
| 103.636 | 0.000 | 16.169 | 10.469          | 6902.69             | 0.0038           | 0.200    |
| 178.127 | 0.000 | 23.017 | 14.800          | 13793.39            | 0.0019           | 0.200    |
| 257.388 | 0.000 | 29.323 | 18.795          | 22239.29            | 0.0012           | 0.200    |

NUMBER OF STEPS = 1467

SURFACE LAYER (CENTER) LEVEL = 17.80 M ABOVE DISCHARGE PORT  
AVG DILUTION = 8328.89

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 22204.40

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

.....  
CASE NO. 7 JETLAG 2000  
TITLE Jet7

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

|                            |   |                      |
|----------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS     | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : | STANDARD             |
| TIME STEP CONTRL           | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : | 1500                 |
| PRINTOUT INTERVAL          | : | 100                  |
| MAX NUMBER OF ITERATIONS   | : | 5                    |
| ITERATION ERROR BOUND      | : | 0.00100              |
| APPROX RATIO OF MASS/DMASS | : | 144.0                |

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |     |               |    |     |                  |
|----------|-----|---------------|----|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj | ... | 3.54E-02 (m4/s2) |

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.58E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 0.9403 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.3231 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 1.6043 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 17.6839          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 2.0872           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0565           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0331           |
| Fd       | ... | 28.40         | lm/lb | ... | 2.9107           |
| Uj/Ua    | ... | 17.68         | lM/lb | ... | 4.9660           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0334  |
| lm* | ... | 0.9133  |
| Sm* | ... | 16.6839 |

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|---------|-------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)     | (m)   | (m)    | (m)             |                     |                              |                   |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 3.537             |
| 0.183   | 0.000 | 0.000  | 0.058           | 1.98                | 13.5224                      | 1.885             |
| 0.552   | 0.000 | 0.005  | 0.109           | 3.90                | 6.8556                       | 1.046             |
| 1.296   | 0.000 | 0.038  | 0.198           | 7.72                | 3.4452                       | 0.625             |
| 2.562   | 0.000 | 0.182  | 0.342           | 15.36               | 1.7270                       | 0.417             |
| 4.019   | 0.000 | 0.460  | 0.558           | 30.68               | 0.8643                       | 0.313             |
| 5.748   | 0.000 | 0.856  | 0.866           | 61.29               | 0.4324                       | 0.260             |
| 8.183   | 0.000 | 1.418  | 1.296           | 122.43              | 0.2164                       | 0.232             |
| 11.978  | 0.000 | 2.230  | 1.891           | 244.60              | 0.1083                       | 0.218             |
| 18.133  | 0.000 | 3.403  | 2.722           | 488.72              | 0.0542                       | 0.210             |
| 28.317  | 0.000 | 5.089  | 3.887           | 976.49              | 0.0271                       | 0.206             |
| 45.327  | 0.000 | 7.506  | 5.526           | 1951.18             | 0.0136                       | 0.203             |
| 73.864  | 0.000 | 10.961 | 7.836           | 3898.88             | 0.0068                       | 0.202             |
| 121.829 | 0.000 | 15.887 | 11.099          | 7790.88             | 0.0034                       | 0.201             |
| 202.516 | 0.000 | 22.896 | 15.707          | 15568.15            | 0.0017                       | 0.201             |
| 288.430 | 0.000 | 29.388 | 19.955          | 25100.56            | 0.0011                       | 0.201             |

NUMBER OF STEPS = 1467

SURFACE LAYER (CENTER) LEVEL = 17.28 M ABOVE DISCHARGE PORT  
AVG DILUTION = 9129.61

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 24956.47

1  
ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
.....  
CASE NO. 8 JETLAG 2000  
TITLE Jet8

#### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)

COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

#### ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

#### LENGTH & DILUTION SCALES

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|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.58E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 0.9403 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.3231 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 1.6043 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 17.6839          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 2.0872           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0565           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0331           |
| Fd       | ... | 28.40         | lm/lb | ... | 2.9107           |
| Uj/Ua    | ... | 17.68         | lM/lb | ... | 4.9660           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0334  |
| lm* | ... | 0.9133  |
| Sm* | ... | 16.6839 |

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|---------|-------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)     | (m)   | (m)    | (m)             |                     |                              |                   |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 3.537             |
| -0.173  | 0.000 | 0.000  | 0.061           | 1.98                | 13.5224                      | 1.688             |
| -0.521  | 0.000 | 0.006  | 0.128           | 3.89                | 6.8716                       | 0.749             |
| -1.184  | 0.000 | 0.078  | 0.266           | 7.13                | 3.7278                       | 0.321             |
| -1.968  | 0.000 | 0.514  | 0.561           | 13.48               | 1.9683                       | 0.136             |
| -1.968  | 0.000 | 0.772  | 0.919           | 27.98               | 0.9477                       | 0.105             |
| -1.461  | 0.000 | 1.077  | 1.086           | 54.32               | 0.4879                       | 0.147             |
| 0.074   | 0.000 | 1.658  | 1.404           | 108.48              | 0.2443                       | 0.175             |
| 3.044   | 0.000 | 2.505  | 1.910           | 216.71              | 0.1223                       | 0.189             |
| 8.347   | 0.000 | 3.719  | 2.654           | 432.97              | 0.0612                       | 0.196             |
| 17.499  | 0.000 | 5.443  | 3.723           | 865.11              | 0.0306                       | 0.199             |
| 33.061  | 0.000 | 7.879  | 5.246           | 1728.68             | 0.0153                       | 0.200             |
| 59.353  | 0.000 | 11.317 | 7.408           | 3454.35             | 0.0077                       | 0.200             |
| 103.636 | 0.000 | 16.169 | 10.469          | 6902.69             | 0.0038                       | 0.200             |
| 178.127 | 0.000 | 23.017 | 14.800          | 13793.39            | 0.0019                       | 0.200             |
| 257.388 | 0.000 | 29.323 | 18.795          | 22239.29            | 0.0012                       | 0.200             |

NUMBER OF STEPS = 1467

SURFACE LAYER (CENTER) LEVEL = 17.80 M ABOVE DISCHARGE PORT

AVG DILUTION = 8328.89

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 22204.40

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

|          |      |             |
|----------|------|-------------|
| CASE NO. | 9    | JETLAG 2000 |
| TITLE    | Jet9 |             |

INPUT PARAMETERS

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|                            |   |                      |
|----------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS     | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : | STANDARD             |
| TIME STEP CONTRL           | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : | 1500                 |
| PRINTOUT INTERVAL          | : | 100                  |
| MAX NUMBER OF ITERATIONS   | : | 5                    |
| ITERATION ERROR BOUND      | : | 0.00100              |
| APPROX RATIO OF MASS/DMASS | : | 144.0                |

ENVIROMENTAL CONDITIONS

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|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 3.537  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |



# LENGTH & DILUTION SCALES

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|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0100 (m3/s) | Qj    | ... | 1.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 3.54E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 2.58E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 3.5368 (m/s)  | lm    | ... | 0.9403 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.3231 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 1.6043 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 17.6839          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 2.0872           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0565           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0331           |
| Fd       | ... | 28.40         | lm/lb | ... | 2.9107           |
| Uj/Ua    | ... | 17.68         | lM/lb | ... | 4.9660           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dMj | ... | 0.0334  |
| lm* | ... | 0.9133  |
| Sm* | ... | 16.6839 |

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|---------|-------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)     | (m)   | (m)    | (m)             |                     |                              |                   |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 3.537             |
| 0.183   | 0.000 | 0.000  | 0.058           | 1.98                | 13.5224                      | 1.885             |
| 0.552   | 0.000 | 0.005  | 0.109           | 3.90                | 6.8556                       | 1.046             |
| 1.296   | 0.000 | 0.038  | 0.198           | 7.72                | 3.4452                       | 0.625             |
| 2.562   | 0.000 | 0.182  | 0.342           | 15.36               | 1.7270                       | 0.417             |
| 4.019   | 0.000 | 0.460  | 0.558           | 30.68               | 0.8643                       | 0.313             |
| 5.748   | 0.000 | 0.856  | 0.866           | 61.29               | 0.4324                       | 0.260             |
| 8.183   | 0.000 | 1.418  | 1.296           | 122.43              | 0.2164                       | 0.232             |
| 11.978  | 0.000 | 2.230  | 1.891           | 244.60              | 0.1083                       | 0.218             |
| 18.133  | 0.000 | 3.403  | 2.722           | 488.72              | 0.0542                       | 0.210             |
| 28.317  | 0.000 | 5.089  | 3.887           | 976.49              | 0.0271                       | 0.206             |
| 45.327  | 0.000 | 7.506  | 5.526           | 1951.18             | 0.0136                       | 0.203             |
| 73.864  | 0.000 | 10.961 | 7.836           | 3898.88             | 0.0068                       | 0.202             |
| 121.829 | 0.000 | 15.887 | 11.099          | 7790.88             | 0.0034                       | 0.201             |
| 202.516 | 0.000 | 22.896 | 15.707          | 15568.15            | 0.0017                       | 0.201             |
| 288.430 | 0.000 | 29.388 | 19.955          | 25100.56            | 0.0011                       | 0.201             |

NUMBER OF STEPS = 1467

SURFACE LAYER (CENTER) LEVEL = 17.28 M ABOVE DISCHARGE PORT  
AVG DILUTION = 9129.61

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 24956.47

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ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 10 JETLAG 2000

TITLE Jet10

## INPUT PARAMETERS

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|                            |   |                      |
|----------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS     | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : | STANDARD             |
| TIME STEP CONTRL           | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : | 1500                 |
| PRINTOUT INTERVAL          | : | 100                  |
| MAX NUMBER OF ITERATIONS   | : | 5                    |
| ITERATION ERROR BOUND      | : | 0.00100              |
| APPROX RATIO OF MASS/DMASS | : | 144.0                |

## ENVIROMENTAL CONDITIONS

^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|      | DEPTH(m) | S    | T(C)  | SIGMAT | U(m/s) |
|------|----------|------|-------|--------|--------|
| EXIT | 29.30    | 0.00 | 15.00 | -0.84  | 3.537  |

AMBIENT      0.00      35.00      14.00      26.21      0.200  
                  30.00      35.00      14.00      26.21      0.200

LENGTH & DILUTION SCALES

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|              |               |           |                  |
|--------------|---------------|-----------|------------------|
| Total Q ...  | 0.0100 (m3/s) | Qj ...    | 1.00E-02 (m3/s)  |
| Port No. ... | 1             | Mj ...    | 3.54E-02 (m4/s2) |
| Depth ...    | 29.3000 (m)   | Bj ...    | 2.58E-03 (m4/s3) |
| Diameter ... | 0.0600 (m)    | lQ ...    | 0.0532 (m)       |
| Uj ...       | 3.5368 (m/s)  | lm ...    | 0.9403 (m)       |
| Ua ...       | 0.2000 (m/s)  | lb ...    | 0.3231 (m)       |
| dp/pa ...    | 0.02635       | lM ...    | 1.6043 (m)       |
| po ...       | 0.99916(g/cc) | Sm ...    | 17.6839          |
| pa ...       | 1.02621(g/cc) | Sb ...    | 2.0872           |
| Ver. ang ... | 0.00          | lQ/lm ... | 0.0565           |
| Hor. ang ... | 180.00        | lQ/lM ... | 0.0331           |
| Fd ...       | 28.40         | lm/lb ... | 2.9107           |
| Uj/Ua ...    | 17.68         | lM/lb ... | 4.9660           |

Coflowing case:

dMj ... 0.0334  
 lm\* ... 0.9133  
 Sm\* ... 16.6839

| X<br>(m) | Y<br>(m) | Z<br>(m) | PLUME<br>RADIUS<br>(m) | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|----------|----------|----------|------------------------|---------------------|------------------------------|-------------------|
| 0.000    | 0.000    | 0.000    | 0.030                  | 1.00                | 27.0447                      | 3.537             |
| -0.173   | 0.000    | 0.000    | 0.061                  | 1.98                | 13.5224                      | 1.688             |
| -0.521   | 0.000    | 0.006    | 0.128                  | 3.89                | 6.8716                       | 0.749             |
| -1.184   | 0.000    | 0.078    | 0.266                  | 7.13                | 3.7278                       | 0.321             |
| -1.968   | 0.000    | 0.514    | 0.561                  | 13.48               | 1.9683                       | 0.136             |
| -1.968   | 0.000    | 0.772    | 0.919                  | 27.98               | 0.9477                       | 0.105             |
| -1.461   | 0.000    | 1.077    | 1.086                  | 54.32               | 0.4879                       | 0.147             |
| 0.074    | 0.000    | 1.658    | 1.404                  | 108.48              | 0.2443                       | 0.175             |
| 3.044    | 0.000    | 2.505    | 1.910                  | 216.71              | 0.1223                       | 0.189             |
| 8.347    | 0.000    | 3.719    | 2.654                  | 432.97              | 0.0612                       | 0.196             |
| 17.499   | 0.000    | 5.443    | 3.723                  | 865.11              | 0.0306                       | 0.199             |
| 33.061   | 0.000    | 7.879    | 5.246                  | 1728.68             | 0.0153                       | 0.200             |
| 59.353   | 0.000    | 11.317   | 7.408                  | 3454.35             | 0.0077                       | 0.200             |
| 103.636  | 0.000    | 16.169   | 10.469                 | 6902.69             | 0.0038                       | 0.200             |
| 178.127  | 0.000    | 23.017   | 14.800                 | 13793.39            | 0.0019                       | 0.200             |
| 257.388  | 0.000    | 29.323   | 18.795                 | 22239.29            | 0.0012                       | 0.200             |

NUMBER OF STEPS = 1467

SURFACE LAYER (CENTER) LEVEL = 17.80 M ABOVE DISCHARGE PORT

AVG DILUTION = 8328.89

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 22204.40

**SIMULACIÓN 23**

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO.      1      JETLAG 2000  
 TITLE      Jet1

INPUT PARAMETERS

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|                            |                        |
|----------------------------|------------------------|
| ENTRAINMENT HYPOTHESIS     | : ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : STANDARD             |
| TIME STEP CONTRL           | : VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : 1500                 |
| PRINTOUT INTERVAL          | : 100                  |
| MAX NUMBER OF ITERATIONS   | : 5                    |
| ITERATION ERROR BOUND      | : 0.00100              |
| APPROX RATIO OF MASS/DMASS | : 144.0                |

# ENVIROMENTAL CONDITIONS

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|         |          |       |       |        |        |
|---------|----------|-------|-------|--------|--------|
|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| .....   | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
| AMBIENT | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

# LENGTH & DILUTION SCALES

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|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 3.88E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 1.4105 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.4846 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 2.4064 (m)       |
| po       | ... | 0.99916(g/cc) | sm    | ... | 26.5258          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 3.1309           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0377           |
| Hor. ang | ... | 90.00         | lQ/lM | ... | 0.0221           |
| Fd       | ... | 42.60         | lm/lb | ... | 2.9107           |
| Uj/Ua    | ... | 26.53         | lM/lb | ... | 4.9660           |

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|---------|-------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)     | (m)   | (m)    | (m)             |                     |                              |                   |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 5.305             |
| 0.003   | 0.183 | 0.000  | 0.059           | 1.97                | 13.5224                      | 2.696             |
| 0.028   | 0.521 | 0.002  | 0.117           | 3.88                | 6.8884                       | 1.359             |
| 0.113   | 0.999 | 0.013  | 0.229           | 7.69                | 3.4579                       | 0.699             |
| 0.320   | 1.531 | 0.046  | 0.434           | 15.31               | 1.7336                       | 0.388             |
| 0.738   | 2.048 | 0.118  | 0.750           | 30.53               | 0.8684                       | 0.260             |
| 1.605   | 2.563 | 0.271  | 1.156           | 60.85               | 0.4356                       | 0.217             |
| 3.806   | 3.213 | 0.699  | 1.673           | 121.32              | 0.2184                       | 0.207             |
| 8.178   | 3.868 | 1.642  | 2.376           | 242.33              | 0.1093                       | 0.205             |
| 15.399  | 4.410 | 3.173  | 3.367           | 484.32              | 0.0547                       | 0.204             |
| 27.108  | 4.849 | 5.405  | 4.771           | 967.91              | 0.0274                       | 0.203             |
| 46.382  | 5.210 | 8.573  | 6.758           | 1934.26             | 0.0137                       | 0.202             |
| 78.447  | 5.510 | 13.043 | 9.568           | 3865.29             | 0.0069                       | 0.202             |
| 132.081 | 5.761 | 19.345 | 13.541          | 7724.04             | 0.0034                       | 0.201             |
| 222.018 | 5.971 | 28.231 | 19.157          | 15434.76            | 0.0017                       | 0.201             |
| 235.060 | 5.992 | 29.408 | 19.902          | 16656.06            | 0.0016                       | 0.201             |

NUMBER OF STEPS = 1409

SURFACE LAYER (CENTER) LEVEL = 17.15 M ABOVE DISCHARGE PORT  
AVG DILUTION = 6226.52

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 16541.84

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

.....  
CASE NO. 2 JETLAG 2000  
TITLE Jet2

# INPUT PARAMETERS

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|                            |   |                      |
|----------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS     | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : | STANDARD             |
| TIME STEP CONTRL           | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : | 1500                 |
| PRINTOUT INTERVAL          | : | 100                  |
| MAX NUMBER OF ITERATIONS   | : | 5                    |
| ITERATION ERROR BOUND      | : | 0.00100              |
| APPROX RATIO OF MASS/DMASS | : | 144.0                |

# ENVIROMENTAL CONDITIONS

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|         |          |       |       |        |        |
|---------|----------|-------|-------|--------|--------|
|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

#### LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAAAAAAAAAA

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 3.88E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 1.4105 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.4846 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 2.4064 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 26.5258          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 3.1309           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0377           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0221           |
| Fd       | ... | 42.60         | lm/lb | ... | 2.9107           |
| Uj/Ua    | ... | 26.53         | lM/lb | ... | 4.9660           |

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|---------|-------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)     | (m)   | (m)    | (m)             |                     |                              |                   |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 5.305             |
| -0.174  | 0.000 | 0.000  | 0.061           | 1.98                | 13.5224                      | 2.582             |
| -0.526  | 0.000 | 0.003  | 0.125           | 3.89                | 6.8619                       | 1.196             |
| -1.220  | 0.000 | 0.031  | 0.268           | 7.64                | 3.4786                       | 0.508             |
| -2.517  | 0.000 | 0.354  | 0.536           | 13.49               | 1.9671                       | 0.224             |
| -3.060  | 0.000 | 0.987  | 1.146           | 27.93               | 0.9493                       | 0.102             |
| -2.809  | 0.000 | 1.283  | 1.465           | 55.67               | 0.4761                       | 0.124             |
| -1.442  | 0.000 | 1.926  | 1.788           | 108.24              | 0.2448                       | 0.162             |
| 1.640   | 0.000 | 2.949  | 2.378           | 216.22              | 0.1226                       | 0.183             |
| 7.340   | 0.000 | 4.426  | 3.272           | 431.98              | 0.0613                       | 0.193             |
| 17.329  | 0.000 | 6.531  | 4.570           | 863.14              | 0.0307                       | 0.197             |
| 34.431  | 0.000 | 9.513  | 6.426           | 1724.70             | 0.0154                       | 0.199             |
| 63.410  | 0.000 | 13.724 | 9.066           | 3446.42             | 0.0077                       | 0.200             |
| 112.287 | 0.000 | 19.666 | 12.807          | 6886.89             | 0.0038                       | 0.200             |
| 194.555 | 0.000 | 28.052 | 18.104          | 13761.85            | 0.0019                       | 0.200             |
| 208.744 | 0.000 | 29.370 | 18.937          | 15057.83            | 0.0018                       | 0.200             |

NUMBER OF STEPS = 1411

SURFACE LAYER (CENTER) LEVEL = 17.72 M ABOVE DISCHARGE PORT  
AVG DILUTION = 5629.22

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 14988.00

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 3 JETLAG 2000  
TITLE Jet3

#### INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAAAAAAAAAA

|                            |   |                      |
|----------------------------|---|----------------------|
| ENTRAINMENT HYPOTHESIS     | : | ASYMMETRIC           |
| SHEAR ENTRAINMENT          | : | VARIABLE (0 - 0.085) |
| COFLOW FACTOR              | : | STANDARD             |
| TIME STEP CONTRL           | : | VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS   | : | 1500                 |
| PRINTOUT INTERVAL          | : | 100                  |
| MAX NUMBER OF ITERATIONS   | : | 5                    |
| ITERATION ERROR BOUND      | : | 0.00100              |
| APPROX RATIO OF MASS/DMASS | : | 144.0                |

#### ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAAAAAAAAAA

|       |          |       |       |        |        |
|-------|----------|-------|-------|--------|--------|
|       | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
| EXIT  | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| ..... | .....    | ..... | ..... | .....  | .....  |

AMBIENT      0.00      35.00      14.00      26.21      0.200  
                  30.00      35.00      14.00      26.21      0.200

LENGTH & DILUTION SCALES

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|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 3.88E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 1.4105 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.4846 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 2.4064 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 26.5258          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 3.1309           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0377           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0221           |
| Fd       | ... | 42.60         | lm/lb | ... | 2.9107           |
| Uj/Ua    | ... | 26.53         | lM/lb | ... | 4.9660           |

Coflowing case:

dmj      ...      0.0766  
 lm\*      ...      1.3836  
 Sm\*      ...      25.5258

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|---------|-------|--------|-----------------|---------------------|------------------------------|----------|
| (m)     | (m)   | (m)    | (m)             |                     |                              | (m/s)    |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 5.305    |
| 0.181   | 0.000 | 0.000  | 0.058           | 1.98                | 13.5224                      | 2.779    |
| 0.546   | 0.000 | 0.002  | 0.112           | 3.89                | 6.8567                       | 1.494    |
| 1.280   | 0.000 | 0.019  | 0.208           | 7.71                | 3.4464                       | 0.849    |
| 2.749   | 0.000 | 0.118  | 0.372           | 15.33               | 1.7306                       | 0.528    |
| 4.802   | 0.000 | 0.417  | 0.630           | 30.61               | 0.8662                       | 0.369    |
| 7.141   | 0.000 | 0.908  | 1.006           | 61.17               | 0.4333                       | 0.289    |
| 10.074  | 0.000 | 1.588  | 1.537           | 122.23              | 0.2168                       | 0.247    |
| 14.440  | 0.000 | 2.568  | 2.274           | 244.21              | 0.1085                       | 0.225    |
| 21.370  | 0.000 | 3.984  | 3.299           | 487.93              | 0.0543                       | 0.214    |
| 32.716  | 0.000 | 6.025  | 4.731           | 974.93              | 0.0272                       | 0.208    |
| 51.577  | 0.000 | 8.959  | 6.741           | 1948.05             | 0.0136                       | 0.205    |
| 83.147  | 0.000 | 13.160 | 9.573           | 3892.60             | 0.0068                       | 0.203    |
| 136.158 | 0.000 | 19.158 | 13.568          | 7778.37             | 0.0034                       | 0.202    |
| 225.297 | 0.000 | 27.702 | 19.210          | 15543.08            | 0.0017                       | 0.201    |
| 244.371 | 0.000 | 29.371 | 20.308          | 17363.60            | 0.0015                       | 0.201    |

NUMBER OF STEPS = 1414

SURFACE LAYER (CENTER) LEVEL = 17.10 M ABOVE DISCHARGE PORT

AVG DILUTION = 6298.39

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 17283.95

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO.      4      JETLAG 2000

TITLE      Jet4

INPUT PARAMETERS

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ENTRAINMENT HYPOTHESIS      : ASYMMETRIC  
 SHEAR ENTRAINMENT      : VARIABLE (0 - 0.085)  
 COFLOW FACTOR      : STANDARD  
 TIME STEP CONTRL      : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS      : 1500  
 PRINTOUT INTERVAL      : 100  
 MAX NUMBER OF ITERATIONS      : 5  
 ITERATION ERROR BOUND      : 0.00100  
 APPROX RATIO OF MASS/DMASS      : 144.0

ENVIROMENTAL CONDITIONS

^^^^^^^^^^^^^^^^^^^^^^^^^^^^

DEPTH(m)      S      T(C)      SIGMAT      U(m/s)

|         |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|
| EXIT    | 29.30 | 0.00  | 15.00 | -0.84 | 5.305 |
| AMBIENT | 0.00  | 35.00 | 14.00 | 26.21 | 0.200 |
|         | 30.00 | 35.00 | 14.00 | 26.21 | 0.200 |

LENGTH & DILUTION SCALES  
 ^^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 3.88E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 1.4105 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.4846 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 2.4064 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 26.5258          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 3.1309           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0377           |
| Hor. ang | ... | 180.00        | lQ/lM | ... | 0.0221           |
| Fd       | ... | 42.60         | lm/lb | ... | 2.9107           |
| Uj/Ua    | ... | 26.53         | lM/lb | ... | 4.9660           |

Coflowing case:  
 dmj ... 0.0766  
 lm\* ... 1.3836  
 Sm\* ... 25.5258

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|---------|-------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)     | (m)   | (m)    | (m)             |                     |                              |                   |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 5.305             |
| -0.174  | 0.000 | 0.000  | 0.061           | 1.98                | 13.5224                      | 2.582             |
| -0.526  | 0.000 | 0.003  | 0.125           | 3.89                | 6.8619                       | 1.196             |
| -1.220  | 0.000 | 0.031  | 0.268           | 7.64                | 3.4786                       | 0.508             |
| -2.517  | 0.000 | 0.354  | 0.536           | 13.49               | 1.9671                       | 0.224             |
| -3.060  | 0.000 | 0.987  | 1.146           | 27.93               | 0.9493                       | 0.102             |
| -2.809  | 0.000 | 1.283  | 1.465           | 55.67               | 0.4761                       | 0.124             |
| -1.442  | 0.000 | 1.926  | 1.788           | 108.24              | 0.2448                       | 0.162             |
| 1.640   | 0.000 | 2.949  | 2.378           | 216.22              | 0.1226                       | 0.183             |
| 7.340   | 0.000 | 4.426  | 3.272           | 431.98              | 0.0613                       | 0.193             |
| 17.329  | 0.000 | 6.531  | 4.570           | 863.14              | 0.0307                       | 0.197             |
| 34.431  | 0.000 | 9.513  | 6.426           | 1724.70             | 0.0154                       | 0.199             |
| 63.410  | 0.000 | 13.724 | 9.066           | 3446.42             | 0.0077                       | 0.200             |
| 112.287 | 0.000 | 19.666 | 12.807          | 6886.89             | 0.0038                       | 0.200             |
| 194.555 | 0.000 | 28.052 | 18.104          | 13761.85            | 0.0019                       | 0.200             |
| 208.744 | 0.000 | 29.370 | 18.937          | 15057.83            | 0.0018                       | 0.200             |

NUMBER OF STEPS = 1411  
 SURFACE LAYER (CENTER) LEVEL = 17.72 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 5629.22

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 14988.00

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 5 JETLAG 2000  
 TITLE Jet5

INPUT PARAMETERS  
 ^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

# ENVIROMENTAL CONDITIONS

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AAAAAAAAAAAAAAAAAAAA
      DEPTH(m)      S      T(C)      SIGMAT      U(m/s)
EXIT      29.30      0.00      15.00      -0.84      5.305
.....
AMBIENT      0.00      35.00      14.00      26.21      0.200
              30.00      35.00      14.00      26.21      0.200
    
```

# LENGTH & DILUTION SCALES

```

AAAAAAAAAAAAAAAAAAAA
Total Q ... 0.0150 (m3/s)      Qj ... 1.50E-02 (m3/s)
Port No. ... 1      Mj ... 7.96E-02 (m4/s2)
Depth ... 29.3000 (m)      Bj ... 3.88E-03 (m4/s3)
Diameter ... 0.0600 (m)      lQ ... 0.0532 (m)
Uj ... 5.3052 (m/s)      lm ... 1.4105 (m)
Ua ... 0.2000 (m/s)      lb ... 0.4846 (m)
dp/pa ... 0.02635      lM ... 2.4064 (m)
po ... 0.99916(g/cc)      Sm ... 26.5258
pa ... 1.02621(g/cc)      Sb ... 3.1309
Ver. ang ... 0.00      lQ/lm ... 0.0377
Hor. ang ... 0.00      lQ/lM ... 0.0221
Fd ... 42.60      lm/lb ... 2.9107
Uj/Ua ... 26.53      lM/lb ... 4.9660
    
```

## Coflowing case:

```

dMj ... 0.0766
lm* ... 1.3836
Sm* ... 25.5258
    
```

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|---------|-------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)     | (m)   | (m)    | (m)             |                     |                              |                   |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 5.305             |
| 0.181   | 0.000 | 0.000  | 0.058           | 1.98                | 13.5224                      | 2.779             |
| 0.546   | 0.000 | 0.002  | 0.112           | 3.89                | 6.8567                       | 1.494             |
| 1.280   | 0.000 | 0.019  | 0.208           | 7.71                | 3.4464                       | 0.849             |
| 2.749   | 0.000 | 0.118  | 0.372           | 15.33               | 1.7306                       | 0.528             |
| 4.802   | 0.000 | 0.417  | 0.630           | 30.61               | 0.8662                       | 0.369             |
| 7.141   | 0.000 | 0.908  | 1.006           | 61.17               | 0.4333                       | 0.289             |
| 10.074  | 0.000 | 1.588  | 1.537           | 122.23              | 0.2168                       | 0.247             |
| 14.440  | 0.000 | 2.568  | 2.274           | 244.21              | 0.1085                       | 0.225             |
| 21.370  | 0.000 | 3.984  | 3.299           | 487.93              | 0.0543                       | 0.214             |
| 32.716  | 0.000 | 6.025  | 4.731           | 974.93              | 0.0272                       | 0.208             |
| 51.577  | 0.000 | 8.959  | 6.741           | 1948.05             | 0.0136                       | 0.205             |
| 83.147  | 0.000 | 13.160 | 9.573           | 3892.60             | 0.0068                       | 0.203             |
| 136.158 | 0.000 | 19.158 | 13.568          | 7778.37             | 0.0034                       | 0.202             |
| 225.297 | 0.000 | 27.702 | 19.210          | 15543.08            | 0.0017                       | 0.201             |
| 244.371 | 0.000 | 29.371 | 20.308          | 17363.60            | 0.0015                       | 0.201             |

NUMBER OF STEPS = 1414

SURFACE LAYER (CENTER) LEVEL = 17.10 M ABOVE DISCHARGE PORT  
AVG DILUTION = 6298.39

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 17283.95

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

.....  
CASE NO. 6 JETLAG 2000  
TITLE Jet6

## INPUT PARAMETERS

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AAAAAAAAAAAAAAAAAAAA
ENTRAINMENT HYPOTHESIS      : ASYMMETRIC
SHEAR ENTRAINMENT           : VARIABLE (0 - 0.085)
COFLOW FACTOR                : STANDARD
TIME STEP CONTRL             : VARIABLE ( > 0.985 )
MAX NUMBER OF TIME STEPS     : 1500
PRINTOUT INTERVAL            : 100
MAX NUMBER OF ITERATIONS     : 5
ITERATION ERROR BOUND        : 0.00100
    
```

APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES

^^

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj    | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 3.88E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | lm    | ... 1.4105 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.4846 (m)       |
| dp/pa    | ... 0.02635       | lM    | ... 2.4064 (m)       |
| po       | ... 0.99916(g/cc) | Sm    | ... 26.5258          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 3.1309           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0377           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0221           |
| Fd       | ... 42.60         | lm/lb | ... 2.9107           |
| Uj/Ua    | ... 26.53         | lM/lb | ... 4.9660           |

Coflowing case:

|     |             |
|-----|-------------|
| dmj | ... 0.0766  |
| lm* | ... 1.3836  |
| Sm* | ... 25.5258 |

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|---------|-------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)     | (m)   | (m)    | (m)             |                     |                              |                   |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 5.305             |
| -0.174  | 0.000 | 0.000  | 0.061           | 1.98                | 13.5224                      | 2.582             |
| -0.526  | 0.000 | 0.003  | 0.125           | 3.89                | 6.8619                       | 1.196             |
| -1.220  | 0.000 | 0.031  | 0.268           | 7.64                | 3.4786                       | 0.508             |
| -2.517  | 0.000 | 0.354  | 0.536           | 13.49               | 1.9671                       | 0.224             |
| -3.060  | 0.000 | 0.987  | 1.146           | 27.93               | 0.9493                       | 0.102             |
| -2.809  | 0.000 | 1.283  | 1.465           | 55.67               | 0.4761                       | 0.124             |
| -1.442  | 0.000 | 1.926  | 1.788           | 108.24              | 0.2448                       | 0.162             |
| 1.640   | 0.000 | 2.949  | 2.378           | 216.22              | 0.1226                       | 0.183             |
| 7.340   | 0.000 | 4.426  | 3.272           | 431.98              | 0.0613                       | 0.193             |
| 17.329  | 0.000 | 6.531  | 4.570           | 863.14              | 0.0307                       | 0.197             |
| 34.431  | 0.000 | 9.513  | 6.426           | 1724.70             | 0.0154                       | 0.199             |
| 63.410  | 0.000 | 13.724 | 9.066           | 3446.42             | 0.0077                       | 0.200             |
| 112.287 | 0.000 | 19.666 | 12.807          | 6886.89             | 0.0038                       | 0.200             |
| 194.555 | 0.000 | 28.052 | 18.104          | 13761.85            | 0.0019                       | 0.200             |
| 208.744 | 0.000 | 29.370 | 18.937          | 15057.83            | 0.0018                       | 0.200             |

NUMBER OF STEPS = 1411

SURFACE LAYER (CENTER) LEVEL = 17.72 M ABOVE DISCHARGE PORT

AVG DILUTION = 5629.22

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 14988.00

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

.....

CASE NO. 7 JETLAG 2000

TITLE Jet7

INPUT PARAMETERS

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|                          |                        |
|--------------------------|------------------------|
| ENTRAINMENT HYPOTHESIS   | : ASYMMETRIC           |
| SHEAR ENTRAINMENT        | : VARIABLE (0 - 0.085) |
| COFLOW FACTOR            | : STANDARD             |
| TIME STEP CONTRL         | : VARIABLE ( > 0.985 ) |
| MAX NUMBER OF TIME STEPS | : 1500                 |



PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0150 (m3/s) | Qj    | ... | 1.50E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 7.96E-02 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 3.88E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 5.3052 (m/s)  | lm    | ... | 1.4105 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.4846 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 2.4064 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 26.5258          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 3.1309           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0377           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0221           |
| Fd       | ... | 42.60         | lm/lb | ... | 2.9107           |
| Uj/Ua    | ... | 26.53         | lM/lb | ... | 4.9660           |

Coflowing case:  
 dmj ... 0.0766  
 lm\* ... 1.3836  
 Sm\* ... 25.5258

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|---------|-------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)     | (m)   | (m)    | (m)             |                     |                              |                   |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 5.305             |
| 0.181   | 0.000 | 0.000  | 0.058           | 1.98                | 13.5224                      | 2.779             |
| 0.546   | 0.000 | 0.002  | 0.112           | 3.89                | 6.8567                       | 1.494             |
| 1.280   | 0.000 | 0.019  | 0.208           | 7.71                | 3.4464                       | 0.849             |
| 2.749   | 0.000 | 0.118  | 0.372           | 15.33               | 1.7306                       | 0.528             |
| 4.802   | 0.000 | 0.417  | 0.630           | 30.61               | 0.8662                       | 0.369             |
| 7.141   | 0.000 | 0.908  | 1.006           | 61.17               | 0.4333                       | 0.289             |
| 10.074  | 0.000 | 1.588  | 1.537           | 122.23              | 0.2168                       | 0.247             |
| 14.440  | 0.000 | 2.568  | 2.274           | 244.21              | 0.1085                       | 0.225             |
| 21.370  | 0.000 | 3.984  | 3.299           | 487.93              | 0.0543                       | 0.214             |
| 32.716  | 0.000 | 6.025  | 4.731           | 974.93              | 0.0272                       | 0.208             |
| 51.577  | 0.000 | 8.959  | 6.741           | 1948.05             | 0.0136                       | 0.205             |
| 83.147  | 0.000 | 13.160 | 9.573           | 3892.60             | 0.0068                       | 0.203             |
| 136.158 | 0.000 | 19.158 | 13.568          | 7778.37             | 0.0034                       | 0.202             |
| 225.297 | 0.000 | 27.702 | 19.210          | 15543.08            | 0.0017                       | 0.201             |
| 244.371 | 0.000 | 29.371 | 20.308          | 17363.60            | 0.0015                       | 0.201             |

NUMBER OF STEPS = 1414  
 SURFACE LAYER (CENTER) LEVEL = 17.10 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 6298.39

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 17283.95

1 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 CASE NO. 8 JETLAG 2000  
 TITLE Jet8

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)

COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIRONMENTAL CONDITIONS  
 ^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^  

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj    | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 3.88E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | lm    | ... 1.4105 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.4846 (m)       |
| dp/pa    | ... 0.02635       | lM    | ... 2.4064 (m)       |
| po       | ... 0.99916(g/cc) | Sm    | ... 26.5258          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 3.1309           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0377           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0221           |
| Fd       | ... 42.60         | lm/lb | ... 2.9107           |
| Uj/Ua    | ... 26.53         | lM/lb | ... 4.9660           |

Coflowing case:  
 dMj ... 0.0766  
 lm\* ... 1.3836  
 Sm\* ... 25.5258

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|---------|-------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)     | (m)   | (m)    | (m)             |                     |                              |                   |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 5.305             |
| -0.174  | 0.000 | 0.000  | 0.061           | 1.98                | 13.5224                      | 2.582             |
| -0.526  | 0.000 | 0.003  | 0.125           | 3.89                | 6.8619                       | 1.196             |
| -1.220  | 0.000 | 0.031  | 0.268           | 7.64                | 3.4786                       | 0.508             |
| -2.517  | 0.000 | 0.354  | 0.536           | 13.49               | 1.9671                       | 0.224             |
| -3.060  | 0.000 | 0.987  | 1.146           | 27.93               | 0.9493                       | 0.102             |
| -2.809  | 0.000 | 1.283  | 1.465           | 55.67               | 0.4761                       | 0.124             |
| -1.442  | 0.000 | 1.926  | 1.788           | 108.24              | 0.2448                       | 0.162             |
| 1.640   | 0.000 | 2.949  | 2.378           | 216.22              | 0.1226                       | 0.183             |
| 7.340   | 0.000 | 4.426  | 3.272           | 431.98              | 0.0613                       | 0.193             |
| 17.329  | 0.000 | 6.531  | 4.570           | 863.14              | 0.0307                       | 0.197             |
| 34.431  | 0.000 | 9.513  | 6.426           | 1724.70             | 0.0154                       | 0.199             |
| 63.410  | 0.000 | 13.724 | 9.066           | 3446.42             | 0.0077                       | 0.200             |
| 112.287 | 0.000 | 19.666 | 12.807          | 6886.89             | 0.0038                       | 0.200             |
| 194.555 | 0.000 | 28.052 | 18.104          | 13761.85            | 0.0019                       | 0.200             |
| 208.744 | 0.000 | 29.370 | 18.937          | 15057.83            | 0.0018                       | 0.200             |

NUMBER OF STEPS = 1411  
 SURFACE LAYER (CENTER) LEVEL = 17.72 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 5629.22

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 14988.00

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 9 JETLAG 2000  
 TITLE Jet9

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

#### ENVIROMENTAL CONDITIONS

^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

#### LENGTH & DILUTION SCALES

^^  

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj    | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 3.88E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | lm    | ... 1.4105 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.4846 (m)       |
| dp/pa    | ... 0.02635       | lm    | ... 2.4064 (m)       |
| po       | ... 0.99916(g/cc) | Sm    | ... 26.5258          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 3.1309           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0377           |
| Hor. ang | ... 0.00          | lQ/lm | ... 0.0221           |
| Fd       | ... 42.60         | lm/lb | ... 2.9107           |
| Uj/Ua    | ... 26.53         | lm/lb | ... 4.9660           |

Coflowing case:

dMj ... 0.0766  
 lm\* ... 1.3836  
 Sm\* ... 25.5258

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF. | VELOCITY |
|---------|-------|--------|-----------------|---------------------|------------------|----------|
| (m)     | (m)   | (m)    | (m)             |                     | (sigmat)         | (m/s)    |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447          | 5.305    |
| 0.181   | 0.000 | 0.000  | 0.058           | 1.98                | 13.5224          | 2.779    |
| 0.546   | 0.000 | 0.002  | 0.112           | 3.89                | 6.8567           | 1.494    |
| 1.280   | 0.000 | 0.019  | 0.208           | 7.71                | 3.4464           | 0.849    |
| 2.749   | 0.000 | 0.118  | 0.372           | 15.33               | 1.7306           | 0.528    |
| 4.802   | 0.000 | 0.417  | 0.630           | 30.61               | 0.8662           | 0.369    |
| 7.141   | 0.000 | 0.908  | 1.006           | 61.17               | 0.4333           | 0.289    |
| 10.074  | 0.000 | 1.588  | 1.537           | 122.23              | 0.2168           | 0.247    |
| 14.440  | 0.000 | 2.568  | 2.274           | 244.21              | 0.1085           | 0.225    |
| 21.370  | 0.000 | 3.984  | 3.299           | 487.93              | 0.0543           | 0.214    |
| 32.716  | 0.000 | 6.025  | 4.731           | 974.93              | 0.0272           | 0.208    |
| 51.577  | 0.000 | 8.959  | 6.741           | 1948.05             | 0.0136           | 0.205    |
| 83.147  | 0.000 | 13.160 | 9.573           | 3892.60             | 0.0068           | 0.203    |
| 136.158 | 0.000 | 19.158 | 13.568          | 7778.37             | 0.0034           | 0.202    |
| 225.297 | 0.000 | 27.702 | 19.210          | 15543.08            | 0.0017           | 0.201    |
| 244.371 | 0.000 | 29.371 | 20.308          | 17363.60            | 0.0015           | 0.201    |

NUMBER OF STEPS = 1414

SURFACE LAYER (CENTER) LEVEL = 17.10 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 6298.39

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 17283.95

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

..... JETLAG 2000

CASE NO. 10

TITLE Jet10

# INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

## ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 5.305  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

## LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0150 (m3/s) | Qj    | ... 1.50E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 7.96E-02 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 3.88E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 5.3052 (m/s)  | lm    | ... 1.4105 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.4846 (m)       |
| dp/pa    | ... 0.02635       | lM    | ... 2.4064 (m)       |
| po       | ... 0.99916(g/cc) | Sm    | ... 26.5258          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 3.1309           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0377           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0221           |
| Fd       | ... 42.60         | lm/lb | ... 2.9107           |
| Uj/Ua    | ... 26.53         | lM/lb | ... 4.9660           |

Coflowing case:

|     |             |
|-----|-------------|
| dMj | ... 0.0766  |
| lm* | ... 1.3836  |
| Sm* | ... 25.5258 |

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|---------|-------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)     | (m)   | (m)    | (m)             |                     |                              |                   |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 5.305             |
| -0.174  | 0.000 | 0.000  | 0.061           | 1.98                | 13.5224                      | 2.582             |
| -0.526  | 0.000 | 0.003  | 0.125           | 3.89                | 6.8619                       | 1.196             |
| -1.220  | 0.000 | 0.031  | 0.268           | 7.64                | 3.4786                       | 0.508             |
| -2.517  | 0.000 | 0.354  | 0.536           | 13.49               | 1.9671                       | 0.224             |
| -3.060  | 0.000 | 0.987  | 1.146           | 27.93               | 0.9493                       | 0.102             |
| -2.809  | 0.000 | 1.283  | 1.465           | 55.67               | 0.4761                       | 0.124             |
| -1.442  | 0.000 | 1.926  | 1.788           | 108.24              | 0.2448                       | 0.162             |
| 1.640   | 0.000 | 2.949  | 2.378           | 216.22              | 0.1226                       | 0.183             |
| 7.340   | 0.000 | 4.426  | 3.272           | 431.98              | 0.0613                       | 0.193             |
| 17.329  | 0.000 | 6.531  | 4.570           | 863.14              | 0.0307                       | 0.197             |
| 34.431  | 0.000 | 9.513  | 6.426           | 1724.70             | 0.0154                       | 0.199             |
| 63.410  | 0.000 | 13.724 | 9.066           | 3446.42             | 0.0077                       | 0.200             |
| 112.287 | 0.000 | 19.666 | 12.807          | 6886.89             | 0.0038                       | 0.200             |
| 194.555 | 0.000 | 28.052 | 18.104          | 13761.85            | 0.0019                       | 0.200             |
| 208.744 | 0.000 | 29.370 | 18.937          | 15057.83            | 0.0018                       | 0.200             |

NUMBER OF STEPS = 1411

SURFACE LAYER (CENTER) LEVEL = 17.72 M ABOVE DISCHARGE PORT  
 AVG DILUTION = 5629.22

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 14988.00

## SIMULACIÓN 24

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 1 JETLAG 2000  
TITLE Jet1

### INPUT PARAMETERS ^^^^^^^^^^^^^^^^^^^^

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

### ENVIROMENTAL CONDITIONS ^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

### LENGTH & DILUTION SCALES ^^^^^^^^^^^^^^^^^^^^

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0200 (m3/s) | Qj    | ... 2.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 1.41E-01 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 5.17E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 7.0736 (m/s)  | lm    | ... 1.8806 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.6461 (m)       |
| dp/pa    | ... 0.02635       | lM    | ... 3.2085 (m)       |
| po       | ... 0.99916(g/cc) | sm    | ... 35.3678          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 4.1745           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0283           |
| Hor. ang | ... 90.00         | lQ/lM | ... 0.0166           |
| Fd       | ... 56.80         | lm/lb | ... 2.9107           |
| Uj/Ua    | ... 35.37         | lM/lb | ... 4.9660           |

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|---------|-------|--------|-----------------|---------------------|------------------------------|----------|
| (m)     | (m)   | (m)    | (m)             |                     |                              | (m/s)    |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 7.074    |
| 0.002   | 0.178 | 0.000  | 0.059           | 1.97                | 13.5224                      | 3.588    |
| 0.022   | 0.542 | 0.001  | 0.117           | 3.87                | 6.8918                       | 1.808    |
| 0.099   | 1.110 | 0.010  | 0.231           | 7.68                | 3.4610                       | 0.920    |
| 0.302   | 1.805 | 0.039  | 0.446           | 15.29               | 1.7354                       | 0.490    |
| 0.734   | 2.513 | 0.111  | 0.805           | 30.50               | 0.8694                       | 0.300    |
| 1.563   | 3.179 | 0.255  | 1.299           | 60.84               | 0.4356                       | 0.230    |
| 3.592   | 3.974 | 0.630  | 1.917           | 121.25              | 0.2186                       | 0.210    |
| 8.137   | 4.877 | 1.581  | 2.736           | 242.06              | 0.1095                       | 0.206    |
| 16.014  | 5.665 | 3.288  | 3.880           | 483.73              | 0.0548                       | 0.205    |
| 28.757  | 6.303 | 5.845  | 5.500           | 966.79              | 0.0274                       | 0.203    |
| 49.600  | 6.824 | 9.501  | 7.792           | 1932.08             | 0.0137                       | 0.203    |
| 84.147  | 7.256 | 14.665 | 11.035          | 3860.98             | 0.0069                       | 0.202    |
| 141.827 | 7.616 | 21.947 | 15.619          | 7715.45             | 0.0034                       | 0.201    |
| 209.440 | 7.848 | 29.306 | 20.264          | 12967.36            | 0.0020                       | 0.201    |

NUMBER OF STEPS = 1373

SURFACE LAYER (CENTER) LEVEL = 16.88 M ABOVE DISCHARGE PORT  
AVG DILUTION = 4890.11

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

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1  AVG DILUTION AT WATER SURFACE = 12962.59
1  ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT
.....
CASE NO.      2                                     JETLAG 2000
TITLE        Jet2

INPUT PARAMETERS
AAAAAAAAAAAAAAAA
ENTRAINMENT HYPOTHESIS : ASYMMETRIC
SHEAR ENTRAINMENT      : VARIABLE (0 - 0.085)
COFLOW FACTOR          : STANDARD
TIME STEP CONTRL       : VARIABLE ( > 0.985 )
MAX NUMBER OF TIME STEPS : 1500
PRINTOUT INTERVAL      : 100
MAX NUMBER OF ITERATIONS : 5
ITERATION ERROR BOUND  : 0.00100
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS
AAAAAAAAAAAAAAAA
      DEPTH(m)      S      T(C)      SIGMAT      U(m/s)
EXIT      29.30      0.00      15.00      -0.84      7.074
.....
AMBIENT    0.00      35.00      14.00      26.21      0.200
           30.00      35.00      14.00      26.21      0.200

LENGTH & DILUTION SCALES
AAAAAAAAAAAAAAAA
Total Q ... 0.0200 (m3/s)      Qj ... 2.00E-02 (m3/s)
Port No. ... 1                Mj ... 1.41E-01 (m4/s2)
Depth ... 29.3000 (m)         Bj ... 5.17E-03 (m4/s3)
Diameter ... 0.0600 (m)       lQ ... 0.0532 (m)
Uj ... 7.0736 (m/s)          lm ... 1.8806 (m)
Ua ... 0.2000 (m/s)          lb ... 0.6461 (m)
dp/pa ... 0.02635            lM ... 3.2085 (m)
po ... 0.99916(g/cc)         sm ... 35.3678
pa ... 1.02621(g/cc)         Sb ... 4.1745
Ver. ang ... 0.00            lQ/lm ... 0.0283
Hor. ang ... 180.00          lQ/lM ... 0.0166
Fd ... 56.80                 lm/lb ... 2.9107
Uj/Ua ... 35.37              lM/lb ... 4.9660

      X      Y      Z      PLUME      AVERAGE      DENSITY      VELOCITY
      (m)    (m)    (m)    RADIUS    DILUTION      DIFF.        (m/s)
      .....
      0.000    0.000    0.000    0.030      1.00      27.0447      7.074
      -0.175    0.000    0.000    0.060      1.98      13.5224      3.475
      -0.528    0.000    0.001    0.123      3.89      6.8612      1.644
      -1.234    0.000    0.016    0.259      7.69      3.4559      0.728
      -2.578    0.000    0.178    0.533     14.04      1.8905      0.315
      -4.047    0.000    1.042    1.156     27.24      0.9736      0.130
      -4.008    0.000    1.523    1.824     55.85      0.4746      0.107
      -2.943    0.000    2.147    2.158    108.51      0.2442      0.148
      0.156     0.000    3.312    2.800    216.75      0.1223      0.176
      6.117     0.000    5.009    3.814    433.05      0.0612      0.190
      16.736    0.000    7.438    5.302    865.25      0.0306      0.196
      35.045    0.000    10.884   7.441   1728.90      0.0153      0.199
      66.165    0.000    15.756   10.487  3454.76      0.0077      0.200
      118.728   0.000    22.631   14.809  6903.59      0.0038      0.200
      178.652   0.000    29.376   19.062 11443.34      0.0023      0.200

NUMBER OF STEPS = 1371
SURFACE LAYER (CENTER) LEVEL = 17.63 M ABOVE DISCHARGE PORT
AVG DILUTION = 4279.10

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE
AVG DILUTION AT WATER SURFACE = 11385.78
1  ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT
.....

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CASE NO. 3  
TITLE Jet3

JETLAG 2000

INPUT PARAMETERS  
^^^^^^^^^^^^^^^^^^^^

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES  
^^^^^^^^^^^^^^^^^^^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.17E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.6461 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 3.2085 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 4.1745           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0166           |
| Fd       | ... | 56.80         | lm/lb | ... | 2.9107           |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 4.9660           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dmj | ... | 0.1375  |
| lm* | ... | 1.8539  |
| Sm* | ... | 34.3678 |

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|---------|-------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)     | (m)   | (m)    | (m)             |                     |                              |                   |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 7.074             |
| 0.180   | 0.000 | 0.000  | 0.059           | 1.98                | 13.5224                      | 3.672             |
| 0.543   | 0.000 | 0.001  | 0.113           | 3.89                | 6.8573                       | 1.942             |
| 1.272   | 0.000 | 0.011  | 0.214           | 7.71                | 3.4470                       | 1.074             |
| 2.735   | 0.000 | 0.074  | 0.391           | 15.33               | 1.7312                       | 0.640             |
| 5.277   | 0.000 | 0.353  | 0.677           | 30.57               | 0.8674                       | 0.424             |
| 8.232   | 0.000 | 0.904  | 1.108           | 61.08               | 0.4339                       | 0.317             |
| 11.724  | 0.000 | 1.696  | 1.724           | 122.10              | 0.2170                       | 0.262             |
| 16.601  | 0.000 | 2.814  | 2.581           | 243.95              | 0.1086                       | 0.233             |
| 24.188  | 0.000 | 4.432  | 3.772           | 487.42              | 0.0544                       | 0.218             |
| 36.477  | 0.000 | 6.769  | 5.432           | 973.91              | 0.0272                       | 0.210             |
| 56.801  | 0.000 | 10.132 | 7.758           | 1946.01             | 0.0136                       | 0.206             |
| 90.740  | 0.000 | 14.955 | 11.030          | 3888.47             | 0.0068                       | 0.203             |
| 147.669 | 0.000 | 21.850 | 15.644          | 7770.03             | 0.0034                       | 0.202             |
| 218.941 | 0.000 | 29.318 | 20.597          | 13425.61            | 0.0020                       | 0.201             |

NUMBER OF STEPS = 1377

SURFACE LAYER (CENTER) LEVEL = 16.94 M ABOVE DISCHARGE PORT  
AVG DILUTION = 4872.06

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 13409.97

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

.....  
CASE NO. 4 JETLAG 2000  
TITLE Jet4

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0200 (m3/s) | Qj    | ... 2.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 1.41E-01 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 5.17E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 7.0736 (m/s)  | lm    | ... 1.8806 (m)       |
| ua       | ... 0.2000 (m/s)  | lb    | ... 0.6461 (m)       |
| dp/pa    | ... 0.02635       | lM    | ... 3.2085 (m)       |
| po       | ... 0.99916(g/cc) | Sm    | ... 35.3678          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 4.1745           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0283           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0166           |
| Fd       | ... 56.80         | lm/lb | ... 2.9107           |
| Uj/ua    | ... 35.37         | lM/lb | ... 4.9660           |

Coflowing case:

|     |             |
|-----|-------------|
| dMj | ... 0.1375  |
| lm* | ... 1.8539  |
| Sm* | ... 34.3678 |

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|---------|-------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)     | (m)   | (m)    | (m)             |                     |                              |                   |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 7.074             |
| -0.175  | 0.000 | 0.000  | 0.060           | 1.98                | 13.5224                      | 3.475             |
| -0.528  | 0.000 | 0.001  | 0.123           | 3.89                | 6.8612                       | 1.644             |
| -1.234  | 0.000 | 0.016  | 0.259           | 7.69                | 3.4559                       | 0.728             |
| -2.578  | 0.000 | 0.178  | 0.533           | 14.04               | 1.8905                       | 0.315             |
| -4.047  | 0.000 | 1.042  | 1.156           | 27.24               | 0.9736                       | 0.130             |
| -4.008  | 0.000 | 1.523  | 1.824           | 55.85               | 0.4746                       | 0.107             |
| -2.943  | 0.000 | 2.147  | 2.158           | 108.51              | 0.2442                       | 0.148             |
| 0.156   | 0.000 | 3.312  | 2.800           | 216.75              | 0.1223                       | 0.176             |
| 6.117   | 0.000 | 5.009  | 3.814           | 433.05              | 0.0612                       | 0.190             |
| 16.736  | 0.000 | 7.438  | 5.302           | 865.25              | 0.0306                       | 0.196             |
| 35.045  | 0.000 | 10.884 | 7.441           | 1728.90             | 0.0153                       | 0.199             |
| 66.165  | 0.000 | 15.756 | 10.487          | 3454.76             | 0.0077                       | 0.200             |
| 118.728 | 0.000 | 22.631 | 14.809          | 6903.59             | 0.0038                       | 0.200             |
| 178.652 | 0.000 | 29.376 | 19.062          | 11443.34            | 0.0023                       | 0.200             |

NUMBER OF STEPS = 1371

SURFACE LAYER (CENTER) LEVEL = 17.63 M ABOVE DISCHARGE PORT  
AVG DILUTION = 4279.10

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 11385.78



1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 5 JETLAG 2000  
TITLE Jet5

INPUT PARAMETERS

^^^^^^^^^^^^^^^^^^^^

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES

^^^^^^^^^^^^^^^^^^^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.17E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 1.8806 (m)       |
| Ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.6461 (m)       |
| dp/pa    | ... | 0.02635       | lM    | ... | 3.2085 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 4.1745           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 0.00          | lQ/lM | ... | 0.0166           |
| Fd       | ... | 56.80         | lm/lb | ... | 2.9107           |
| Uj/Ua    | ... | 35.37         | lM/lb | ... | 4.9660           |

Coflowing case:

|     |     |         |
|-----|-----|---------|
| dmj | ... | 0.1375  |
| lm* | ... | 1.8539  |
| Sm* | ... | 34.3678 |

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|---------|-------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)     | (m)   | (m)    | (m)             |                     |                              |                   |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 7.074             |
| 0.180   | 0.000 | 0.000  | 0.059           | 1.98                | 13.5224                      | 3.672             |
| 0.543   | 0.000 | 0.001  | 0.113           | 3.89                | 6.8573                       | 1.942             |
| 1.272   | 0.000 | 0.011  | 0.214           | 7.71                | 3.4470                       | 1.074             |
| 2.735   | 0.000 | 0.074  | 0.391           | 15.33               | 1.7312                       | 0.640             |
| 5.277   | 0.000 | 0.353  | 0.677           | 30.57               | 0.8674                       | 0.424             |
| 8.232   | 0.000 | 0.904  | 1.108           | 61.08               | 0.4339                       | 0.317             |
| 11.724  | 0.000 | 1.696  | 1.724           | 122.10              | 0.2170                       | 0.262             |
| 16.601  | 0.000 | 2.814  | 2.581           | 243.95              | 0.1086                       | 0.233             |
| 24.188  | 0.000 | 4.432  | 3.772           | 487.42              | 0.0544                       | 0.218             |
| 36.477  | 0.000 | 6.769  | 5.432           | 973.91              | 0.0272                       | 0.210             |
| 56.801  | 0.000 | 10.132 | 7.758           | 1946.01             | 0.0136                       | 0.206             |
| 90.740  | 0.000 | 14.955 | 11.030          | 3888.47             | 0.0068                       | 0.203             |
| 147.669 | 0.000 | 21.850 | 15.644          | 7770.03             | 0.0034                       | 0.202             |
| 218.941 | 0.000 | 29.318 | 20.597          | 13425.61            | 0.0020                       | 0.201             |

NUMBER OF STEPS = 1377

SURFACE LAYER (CENTER) LEVEL = 16.94 M ABOVE DISCHARGE PORT  
AVG DILUTION = 4872.06

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
 AVG DILUTION AT WATER SURFACE = 13409.97

1  
 ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
 .....  
 CASE NO. 6 JETLAG 2000  
 TITLE Jet6

INPUT PARAMETERS  
 ^^^^^^^^^^^^^^^^^  
 ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
 SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
 COFLOW FACTOR : STANDARD  
 TIME STEP CONTRL : VARIABLE ( > 0.985 )  
 MAX NUMBER OF TIME STEPS : 1500  
 PRINTOUT INTERVAL : 100  
 MAX NUMBER OF ITERATIONS : 5  
 ITERATION ERROR BOUND : 0.00100  
 APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
 ^^^^^^^^^^^^^^^^^  

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES  
 ^^^^^^^^^^^^^^^^^  

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0200 (m3/s) | Qj    | ... 2.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 1.41E-01 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 5.17E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 7.0736 (m/s)  | lm    | ... 1.8806 (m)       |
| ua       | ... 0.2000 (m/s)  | lb    | ... 0.6461 (m)       |
| dp/pa    | ... 0.02635       | lm    | ... 3.2085 (m)       |
| po       | ... 0.99916(g/cc) | sm    | ... 35.3678          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 4.1745           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0283           |
| Hor. ang | ... 180.00        | lQ/lm | ... 0.0166           |
| Fd       | ... 56.80         | lm/lb | ... 2.9107           |
| Uj/ua    | ... 35.37         | lm/lb | ... 4.9660           |

Coflowing case:  
 dmj ... 0.1375  
 lm\* ... 1.8539  
 sm\* ... 34.3678

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|---------|-------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)     | (m)   | (m)    | (m)             |                     |                              |                   |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 7.074             |
| -0.175  | 0.000 | 0.000  | 0.060           | 1.98                | 13.5224                      | 3.475             |
| -0.528  | 0.000 | 0.001  | 0.123           | 3.89                | 6.8612                       | 1.644             |
| -1.234  | 0.000 | 0.016  | 0.259           | 7.69                | 3.4559                       | 0.728             |
| -2.578  | 0.000 | 0.178  | 0.533           | 14.04               | 1.8905                       | 0.315             |
| -4.047  | 0.000 | 1.042  | 1.156           | 27.24               | 0.9736                       | 0.130             |
| -4.008  | 0.000 | 1.523  | 1.824           | 55.85               | 0.4746                       | 0.107             |
| -2.943  | 0.000 | 2.147  | 2.158           | 108.51              | 0.2442                       | 0.148             |
| 0.156   | 0.000 | 3.312  | 2.800           | 216.75              | 0.1223                       | 0.176             |
| 6.117   | 0.000 | 5.009  | 3.814           | 433.05              | 0.0612                       | 0.190             |
| 16.736  | 0.000 | 7.438  | 5.302           | 865.25              | 0.0306                       | 0.196             |
| 35.045  | 0.000 | 10.884 | 7.441           | 1728.90             | 0.0153                       | 0.199             |
| 66.165  | 0.000 | 15.756 | 10.487          | 3454.76             | 0.0077                       | 0.200             |
| 118.728 | 0.000 | 22.631 | 14.809          | 6903.59             | 0.0038                       | 0.200             |
| 178.652 | 0.000 | 29.376 | 19.062          | 11443.34            | 0.0023                       | 0.200             |

NUMBER OF STEPS = 1371  
 SURFACE LAYER (CENTER) LEVEL = 17.63 M ABOVE DISCHARGE PORT

AVG DILUTION = 4279.10

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 11385.78

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 7 JETLAG 2000  
TITLE Jet7

INPUT PARAMETERS  
^^^^^^^^^^^^^^^^^^^^

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES  
^^^^^^^^^^^^^^^^^^^^

|          |     |               |       |     |                  |
|----------|-----|---------------|-------|-----|------------------|
| Total Q  | ... | 0.0200 (m3/s) | Qj    | ... | 2.00E-02 (m3/s)  |
| Port No. | ... | 1             | Mj    | ... | 1.41E-01 (m4/s2) |
| Depth    | ... | 29.3000 (m)   | Bj    | ... | 5.17E-03 (m4/s3) |
| Diameter | ... | 0.0600 (m)    | lQ    | ... | 0.0532 (m)       |
| Uj       | ... | 7.0736 (m/s)  | lm    | ... | 1.8806 (m)       |
| ua       | ... | 0.2000 (m/s)  | lb    | ... | 0.6461 (m)       |
| dp/pa    | ... | 0.02635       | lm    | ... | 3.2085 (m)       |
| po       | ... | 0.99916(g/cc) | Sm    | ... | 35.3678          |
| pa       | ... | 1.02621(g/cc) | Sb    | ... | 4.1745           |
| Ver. ang | ... | 0.00          | lQ/lm | ... | 0.0283           |
| Hor. ang | ... | 0.00          | lQ/lm | ... | 0.0166           |
| Fd       | ... | 56.80         | lm/lb | ... | 2.9107           |
| Uj/Ua    | ... | 35.37         | lm/lb | ... | 4.9660           |

Coflowing case:  
dmj ... 0.1375  
lm\* ... 1.8539  
Sm\* ... 34.3678

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|---------|-------|--------|-----------------|---------------------|------------------------------|----------|
| (m)     | (m)   | (m)    | (m)             |                     |                              | (m/s)    |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 7.074    |
| 0.180   | 0.000 | 0.000  | 0.059           | 1.98                | 13.5224                      | 3.672    |
| 0.543   | 0.000 | 0.001  | 0.113           | 3.89                | 6.8573                       | 1.942    |
| 1.272   | 0.000 | 0.011  | 0.214           | 7.71                | 3.4470                       | 1.074    |
| 2.735   | 0.000 | 0.074  | 0.391           | 15.33               | 1.7312                       | 0.640    |
| 5.277   | 0.000 | 0.353  | 0.677           | 30.57               | 0.8674                       | 0.424    |
| 8.232   | 0.000 | 0.904  | 1.108           | 61.08               | 0.4339                       | 0.317    |
| 11.724  | 0.000 | 1.696  | 1.724           | 122.10              | 0.2170                       | 0.262    |
| 16.601  | 0.000 | 2.814  | 2.581           | 243.95              | 0.1086                       | 0.233    |
| 24.188  | 0.000 | 4.432  | 3.772           | 487.42              | 0.0544                       | 0.218    |
| 36.477  | 0.000 | 6.769  | 5.432           | 973.91              | 0.0272                       | 0.210    |
| 56.801  | 0.000 | 10.132 | 7.758           | 1946.01             | 0.0136                       | 0.206    |
| 90.740  | 0.000 | 14.955 | 11.030          | 3888.47             | 0.0068                       | 0.203    |
| 147.669 | 0.000 | 21.850 | 15.644          | 7770.03             | 0.0034                       | 0.202    |
| 218.941 | 0.000 | 29.318 | 20.597          | 13425.61            | 0.0020                       | 0.201    |

NUMBER OF STEPS = 1377

SURFACE LAYER (CENTER) LEVEL = 16.94 M ABOVE DISCHARGE PORT  
AVG DILUTION = 4872.06

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 13409.97

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 8 JETLAG 2000  
TITLE Jet8

INPUT PARAMETERS  
^^^^^^^^^^^^^^^^^^^^

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100

APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
^^^^^^^^^^^^^^^^^^^^

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES  
^^^^^^^^^^^^^^^^^^^^

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0200 (m3/s) | Qj    | ... 2.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 1.41E-01 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 5.17E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 7.0736 (m/s)  | lm    | ... 1.8806 (m)       |
| Ua       | ... 0.2000 (m/s)  | lb    | ... 0.6461 (m)       |
| dp/pa    | ... 0.02635       | lM    | ... 3.2085 (m)       |
| po       | ... 0.99916(g/cc) | Sm    | ... 35.3678          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 4.1745           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0283           |
| Hor. ang | ... 180.00        | lQ/lM | ... 0.0166           |
| Fd       | ... 56.80         | lm/lb | ... 2.9107           |
| Uj/Ua    | ... 35.37         | lM/lb | ... 4.9660           |

Coflowing case:  
dMj ... 0.1375  
lm\* ... 1.8539  
Sm\* ... 34.3678

| X       | Y     | Z      | PLUME RADIUS | AVERAGE DILUTION | DENSITY DIFF. (sigmat) | VELOCITY |
|---------|-------|--------|--------------|------------------|------------------------|----------|
| (m)     | (m)   | (m)    | (m)          |                  |                        | (m/s)    |
| 0.000   | 0.000 | 0.000  | 0.030        | 1.00             | 27.0447                | 7.074    |
| -0.175  | 0.000 | 0.000  | 0.060        | 1.98             | 13.5224                | 3.475    |
| -0.528  | 0.000 | 0.001  | 0.123        | 3.89             | 6.8612                 | 1.644    |
| -1.234  | 0.000 | 0.016  | 0.259        | 7.69             | 3.4559                 | 0.728    |
| -2.578  | 0.000 | 0.178  | 0.533        | 14.04            | 1.8905                 | 0.315    |
| -4.047  | 0.000 | 1.042  | 1.156        | 27.24            | 0.9736                 | 0.130    |
| -4.008  | 0.000 | 1.523  | 1.824        | 55.85            | 0.4746                 | 0.107    |
| -2.943  | 0.000 | 2.147  | 2.158        | 108.51           | 0.2442                 | 0.148    |
| 0.156   | 0.000 | 3.312  | 2.800        | 216.75           | 0.1223                 | 0.176    |
| 6.117   | 0.000 | 5.009  | 3.814        | 433.05           | 0.0612                 | 0.190    |
| 16.736  | 0.000 | 7.438  | 5.302        | 865.25           | 0.0306                 | 0.196    |
| 35.045  | 0.000 | 10.884 | 7.441        | 1728.90          | 0.0153                 | 0.199    |
| 66.165  | 0.000 | 15.756 | 10.487       | 3454.76          | 0.0077                 | 0.200    |
| 118.728 | 0.000 | 22.631 | 14.809       | 6903.59          | 0.0038                 | 0.200    |
| 178.652 | 0.000 | 29.376 | 19.062       | 11443.34         | 0.0023                 | 0.200    |

NUMBER OF STEPS = 1371  
SURFACE LAYER (CENTER) LEVEL = 17.63 M ABOVE DISCHARGE PORT  
AVG DILUTION = 4279.10

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 11385.78

1  
ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT  
.....  
CASE NO. 9 JETLAG 2000  
TITLE Jet9

INPUT PARAMETERS  
^^^^^^^^^^^^^^^^^^^^  
ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS  
^^^^^^^^^^^^^^^^^^^^  
EXIT DEPTH(m) S T(C) SIGMAT U(m/s)  
29.30 0.00 15.00 -0.84 7.074  
.....  
AMBIENT 0.00 35.00 14.00 26.21 0.200  
30.00 35.00 14.00 26.21 0.200

LENGTH & DILUTION SCALES  
^^^^^^^^^^^^^^^^^^^^  
Total Q ... 0.0200 (m3/s) Qj ... 2.00E-02 (m3/s)  
Port No. ... 1 Mj ... 1.41E-01 (m4/s2)  
Depth ... 29.3000 (m) Bj ... 5.17E-03 (m4/s3)  
Diameter ... 0.0600 (m) lQ ... 0.0532 (m)  
Uj ... 7.0736 (m/s) lm ... 1.8806 (m)  
Ua ... 0.2000 (m/s) lb ... 0.6461 (m)  
dp/pa ... 0.02635 lm ... 3.2085 (m)  
po ... 0.99916(g/cc) sm ... 35.3678  
pa ... 1.02621(g/cc) Sb ... 4.1745  
Ver. ang ... 0.00 lQ/lm ... 0.0283  
Hor. ang ... 0.00 lQ/lm ... 0.0166  
Fd ... 56.80 lm/lb ... 2.9107  
Uj/Ua ... 35.37 lm/lb ... 4.9660

Coflowing case:  
dmj ... 0.1375  
lm\* ... 1.8539  
sm\* ... 34.3678

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY |
|---------|-------|--------|-----------------|---------------------|------------------------------|----------|
| (m)     | (m)   | (m)    | (m)             |                     |                              | (m/s)    |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 7.074    |
| 0.180   | 0.000 | 0.000  | 0.059           | 1.98                | 13.5224                      | 3.672    |
| 0.543   | 0.000 | 0.001  | 0.113           | 3.89                | 6.8573                       | 1.942    |
| 1.272   | 0.000 | 0.011  | 0.214           | 7.71                | 3.4470                       | 1.074    |
| 2.735   | 0.000 | 0.074  | 0.391           | 15.33               | 1.7312                       | 0.640    |
| 5.277   | 0.000 | 0.353  | 0.677           | 30.57               | 0.8674                       | 0.424    |
| 8.232   | 0.000 | 0.904  | 1.108           | 61.08               | 0.4339                       | 0.317    |
| 11.724  | 0.000 | 1.696  | 1.724           | 122.10              | 0.2170                       | 0.262    |
| 16.601  | 0.000 | 2.814  | 2.581           | 243.95              | 0.1086                       | 0.233    |
| 24.188  | 0.000 | 4.432  | 3.772           | 487.42              | 0.0544                       | 0.218    |
| 36.477  | 0.000 | 6.769  | 5.432           | 973.91              | 0.0272                       | 0.210    |
| 56.801  | 0.000 | 10.132 | 7.758           | 1946.01             | 0.0136                       | 0.206    |
| 90.740  | 0.000 | 14.955 | 11.030          | 3888.47             | 0.0068                       | 0.203    |
| 147.669 | 0.000 | 21.850 | 15.644          | 7770.03             | 0.0034                       | 0.202    |

218.941 0.000 29.318 20.597 13425.61 0.0020 0.201

NUMBER OF STEPS = 1377

SURFACE LAYER (CENTER) LEVEL = 16.94 M ABOVE DISCHARGE PORT  
AVG DILUTION = 4872.06

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE  
AVG DILUTION AT WATER SURFACE = 13409.97

1

ARBITRARILY INCLINED BUOYANT JET DISCHARGED IN FLOWING, STRATIFIED AMBIENT

CASE NO. 10 JETLAG 2000

TITLE Jet10

INPUT PARAMETERS

AAAAAAAAAAAAAAAAAAAA

ENTRAINMENT HYPOTHESIS : ASYMMETRIC  
SHEAR ENTRAINMENT : VARIABLE (0 - 0.085)  
COFLOW FACTOR : STANDARD  
TIME STEP CONTRL : VARIABLE ( > 0.985 )  
MAX NUMBER OF TIME STEPS : 1500  
PRINTOUT INTERVAL : 100  
MAX NUMBER OF ITERATIONS : 5  
ITERATION ERROR BOUND : 0.00100  
APPROX RATIO OF MASS/DMASS : 144.0

ENVIROMENTAL CONDITIONS

AAAAAAAAAAAAAAAAAAAA

|         | DEPTH(m) | S     | T(C)  | SIGMAT | U(m/s) |
|---------|----------|-------|-------|--------|--------|
| EXIT    | 29.30    | 0.00  | 15.00 | -0.84  | 7.074  |
| .....   | .....    | ..... | ..... | .....  | .....  |
| AMBIENT | 0.00     | 35.00 | 14.00 | 26.21  | 0.200  |
|         | 30.00    | 35.00 | 14.00 | 26.21  | 0.200  |

LENGTH & DILUTION SCALES

AAAAAAAAAAAAAAAAAAAA

|          |                   |       |                      |
|----------|-------------------|-------|----------------------|
| Total Q  | ... 0.0200 (m3/s) | Qj    | ... 2.00E-02 (m3/s)  |
| Port No. | ... 1             | Mj    | ... 1.41E-01 (m4/s2) |
| Depth    | ... 29.3000 (m)   | Bj    | ... 5.17E-03 (m4/s3) |
| Diameter | ... 0.0600 (m)    | lQ    | ... 0.0532 (m)       |
| Uj       | ... 7.0736 (m/s)  | lm    | ... 1.8806 (m)       |
| ua       | ... 0.2000 (m/s)  | lb    | ... 0.6461 (m)       |
| dp/pa    | ... 0.02635       | lm    | ... 3.2085 (m)       |
| po       | ... 0.99916(g/cc) | Sm    | ... 35.3678          |
| pa       | ... 1.02621(g/cc) | Sb    | ... 4.1745           |
| Ver. ang | ... 0.00          | lQ/lm | ... 0.0283           |
| Hor. ang | ... 180.00        | lQ/lm | ... 0.0166           |
| Fd       | ... 56.80         | lm/lb | ... 2.9107           |
| Uj/Ua    | ... 35.37         | lm/lb | ... 4.9660           |

Coflowing case:

dMj ... 0.1375  
lm\* ... 1.8539  
Sm\* ... 34.3678

| X       | Y     | Z      | PLUME<br>RADIUS | AVERAGE<br>DILUTION | DENSITY<br>DIFF.<br>(sigmat) | VELOCITY<br>(m/s) |
|---------|-------|--------|-----------------|---------------------|------------------------------|-------------------|
| (m)     | (m)   | (m)    | (m)             |                     |                              |                   |
| 0.000   | 0.000 | 0.000  | 0.030           | 1.00                | 27.0447                      | 7.074             |
| -0.175  | 0.000 | 0.000  | 0.060           | 1.98                | 13.5224                      | 3.475             |
| -0.528  | 0.000 | 0.001  | 0.123           | 3.89                | 6.8612                       | 1.644             |
| -1.234  | 0.000 | 0.016  | 0.259           | 7.69                | 3.4559                       | 0.728             |
| -2.578  | 0.000 | 0.178  | 0.533           | 14.04               | 1.8905                       | 0.315             |
| -4.047  | 0.000 | 1.042  | 1.156           | 27.24               | 0.9736                       | 0.130             |
| -4.008  | 0.000 | 1.523  | 1.824           | 55.85               | 0.4746                       | 0.107             |
| -2.943  | 0.000 | 2.147  | 2.158           | 108.51              | 0.2442                       | 0.148             |
| 0.156   | 0.000 | 3.312  | 2.800           | 216.75              | 0.1223                       | 0.176             |
| 6.117   | 0.000 | 5.009  | 3.814           | 433.05              | 0.0612                       | 0.190             |
| 16.736  | 0.000 | 7.438  | 5.302           | 865.25              | 0.0306                       | 0.196             |
| 35.045  | 0.000 | 10.884 | 7.441           | 1728.90             | 0.0153                       | 0.199             |
| 66.165  | 0.000 | 15.756 | 10.487          | 3454.76             | 0.0077                       | 0.200             |
| 118.728 | 0.000 | 22.631 | 14.809          | 6903.59             | 0.0038                       | 0.200             |

178.652      0.000      29.376      19.062    11443.34      0.0023      0.200

NUMBER OF STEPS = 1371

SURFACE LAYER (CENTER) LEVEL = 17.63 M ABOVE DISCHARGE PORT

AVG DILUTION = 4279.10

COMPUTATIONS CEASE: PLUME HITS WATER SURFACE

AVG DILUTION AT WATER SURFACE = 11385.78





ANEJO

HIDRAULICO

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## ANEJO

## Hidráulico

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### **1. Introducción.**

Para el cálculo de las pérdidas hidráulicas en el emisario y en el difusor, se ha utilizado un programa basado en Excel, habiéndose calculado las pérdidas para varios caudales.

Dicho programa de cálculo se basa en las formulaciones de pérdidas por fricción de Manning – Stickler y en los algoritmos de Brooks para la distribución de caudales en los difusores.

A las pérdidas en el emisario submarino, se le han añadido las de la conducción en el tramo terrestre, de manera que se puedan aplicar para los dimensionamientos de los equipos de bombeo para el futuro.

### **2. Descripción de los parámetros introducidos en el cálculo**

Los datos introducidos en el programa de cálculo son iguales en todos los casos, a excepción del caudal a verter que varía en los distintos casos, se han analizado los caudales 100, 150 y 200 l/s, como valores de efluente a verter por el emisario según los datos proporcionados por el IBASAN de los caudales actuales y futuros previstos.

Se han considerado en los parámetros geométricos del difusor los siguientes:

Longitud tubo principal conducción marina = 1662 m.

Longitud tubo principal conducción terrestre = 471 m.

Longitud tramo difusor = 60 m.

Nº de bocas difusoras = 10.

Diámetro interior del tramo difusor = variable (0.4 , 0.35, 0.3, 0.25, 0.15 m.)

Diámetro interior tubo principal conducción = 0.4 m.

Diámetro de bocas de salida = 0.06 m.

Por otro lado, se ha aplicado el coeficiente de Manning para el cálculo de pérdidas por fricción en la tubería de Fibrocemento suele tener el valor de 0.09, aún así, se ha optado por aumentar el coeficiente previendo las posibles pérdidas producidas por el envejecimiento o crecimiento marino en la conducción submarina.

Por lo que el coeficiente “n” de Manning adoptado es de 0.010 cumpliendo perfectamente, situándonos dentro de un margen de seguridad razonable.

Respecto a los valores de pérdidas en los distintos elementos del difusor, tales como reducciones, pérdidas localizadas etc., se adjunta la tabla de datos que se han introducido en el programa de cálculo.

**CALCULO HIDRAULICO DE EMISARIOS.**

oct-07

**Emisario D' En Bossa (Ibiza). Conduccion FC**

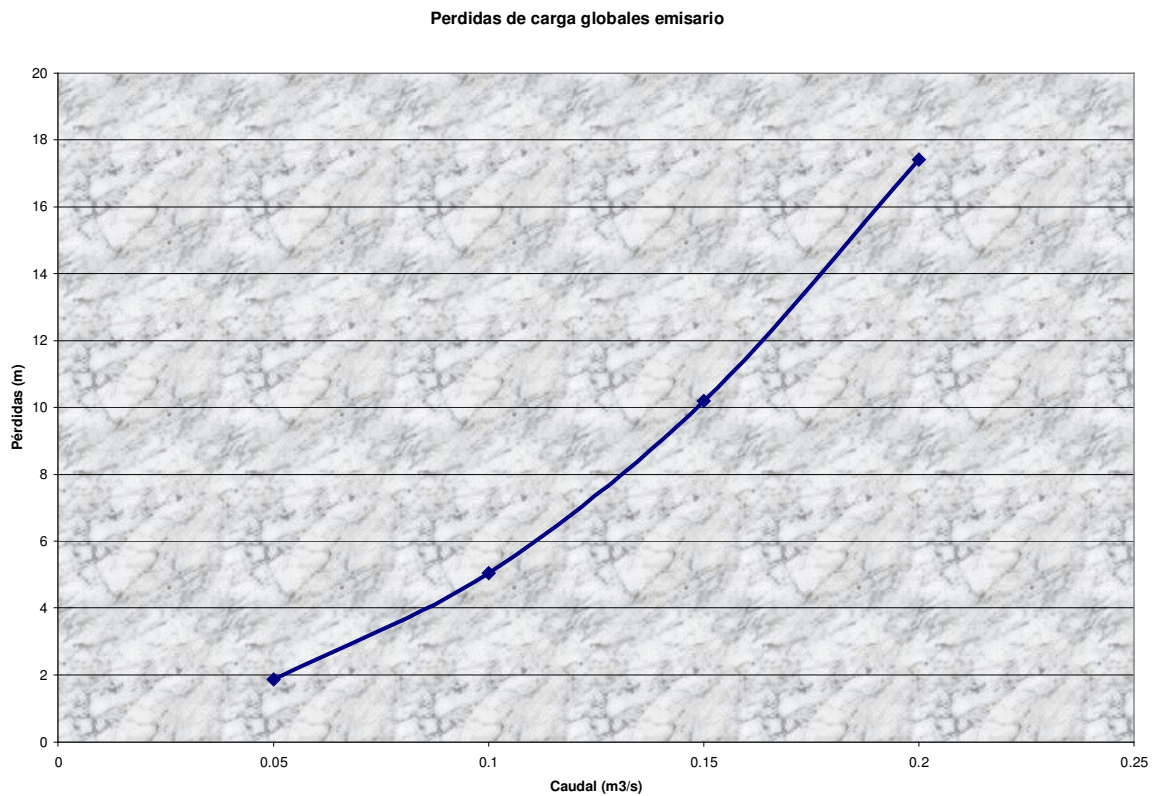
**PARAMETROS BASICOS**

|   |          |               |
|---|----------|---------------|
| Q: - CAUDAL DE CALCULO.                       | (m³/s)   | <b>0.200</b>  |
| M: - NUMERO DE MANNING                        |          | <b>0.010</b>  |
| Pe: - PESO ESPECIFICO DEL EFLUENTE.           | (kgs/m³) | <b>995</b>    |
| Pew: - PESO ESPECIFICO DEL AGUA DE MAR.       | (kgs/m³) | <b>1026</b>   |
| s: - SEPARACION ENTRE DIFUSORES.              | (m)      | <b>6.67</b>   |
| m: - PENDIENTE ZONA DE DIFUSORES.             |          | <b>0.0010</b> |
| H: - PROFUNDIDAD DE VERTIDO. (EN PLEAMAR)     | (m)      | <b>30.00</b>  |
| n: - Nº DE BOCAS DE DIFUSION POR RISER.       |          | <b>1</b>      |
| Kr: - COEF. PERD. LOCALIZADAS EN REDUCCIONES  |          | <b>0.18</b>   |
| Ks: - COEF. PERD. LOCALIZADAS EN CODOS RISERS |          | <b>0.00</b>   |
| Kc: - COEF. PERD. LOCALIZADAS ENTRADA RISERS. |          | <b>0.80</b>   |
| Kd: - COEF. PERD. CINETICA                    |          | <b>1.000</b>  |
| Kv: - COEF. PERD. LOCALIZADAS EN VALVULAS     |          | <b>0</b>      |

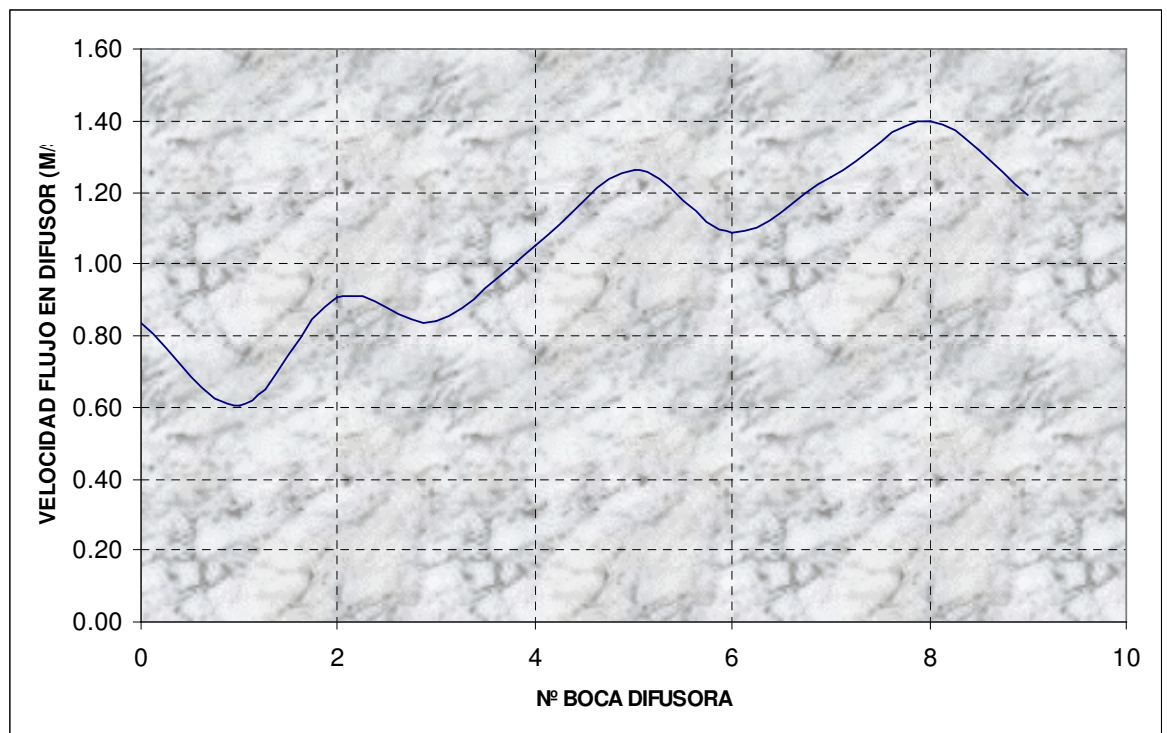
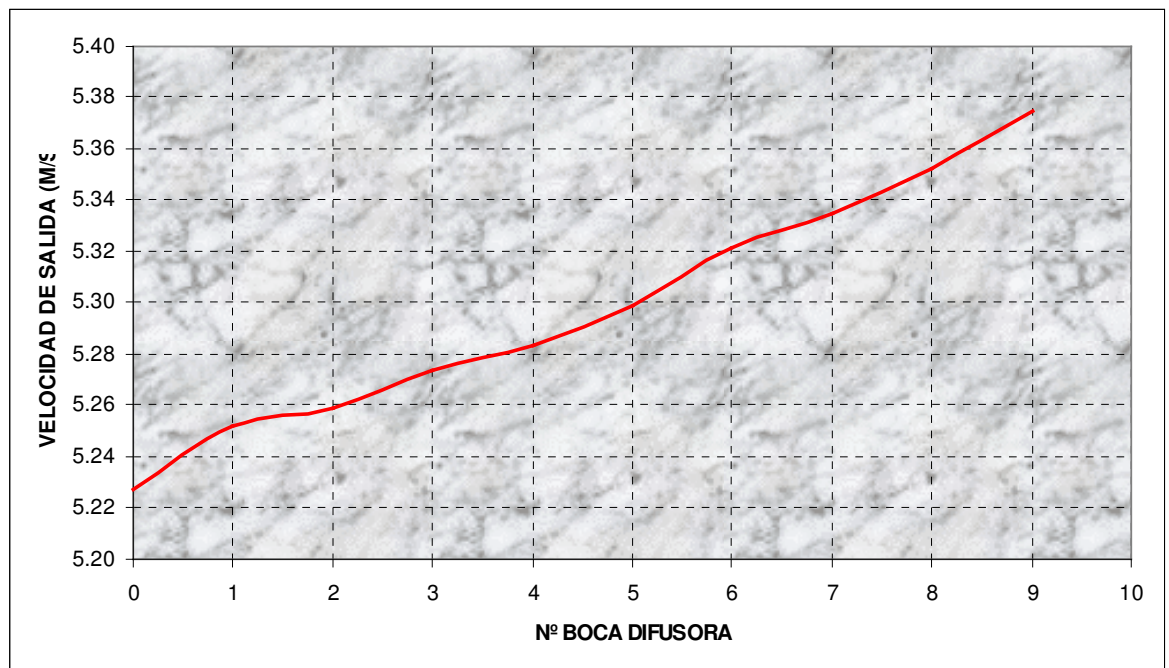
### 3. Análisis de resultados obtenidos

Tal como se observa en el anexo adjunto donde figuran los listados del programa de cálculo, se observa que para un caudal máximo de futuro lejano de 0.2 m<sup>3</sup>/s se tienen unas pérdidas totales de 17.40 m. , siendo además para este caudal la velocidad en el tubo difusor del orden de 0.8 – 1.6 m/s.

En el caso de caudales actuales 0.1 m<sup>3</sup>/s en verano las pérdidas totales se sitúan en el orden de 5.00 m., siendo las velocidades medias en el tubo difusor de 0.8 m/s.



*Pérdidas de carga globales del emisario*



Velocidades en bocas y difusor para  $Q = 0.15 \text{ m}^3/\text{s}$

#### **4. Resumen y conclusiones**

Tal como se muestra en la hoja resumen adjunta, las pérdidas totales superan ligeramente los 10 m. para un caudal de futuro cercano ( $Q = 0.15 \text{ m}^3/\text{s}$ )

Para el caso de futuro lejano con un caudal de 200 l/s, las pérdidas se elevan a 17.4 m. aspecto que tendrá que considerarse a los efectos de renovar los equipos de la estación de bombeo.

Por otro lado la configuración de los difusores es adecuada para este emisario, ya que para los caudales evacuados, se consiguen unas velocidades en el tramo difusor de unos 1.1 m/s, que en promedio se encuentra próximo al 1 m/s recomendado. Asimismo la velocidad de salida de los chorros por los difusores es unos 5 m/s para un caudal de 150 l/s..

## **5. Listados cálculos hidráulicos emisario**

**CALCULO HIDRAULICO DE EMISARIOS.**

oct-07

**Emisario D' En Bossa (Ibiza). Conduccion FC****PARAMETROS BASICOS**

|   |                       |               |
|---|-----------------------|---------------|
| Q: - CAUDAL DE CALCULO.                       | (m <sup>3</sup> /s)   | <b>0.100</b>  |
| M: - NUMERO DE MANNING                        |                       | <b>0.010</b>  |
| Pe: - PESO ESPECIFICO DEL EFLUENTE.           | (kgs/m <sup>3</sup> ) | <b>995</b>    |
| Pew: - PESO ESPECIFICO DEL AGUA DE MAR.       | (kgs/m <sup>3</sup> ) | <b>1026</b>   |
| s: - SEPARACION ENTRE DIFUSORES.              | (m)                   | <b>6.67</b>   |
| m: - PENDIENTE ZONA DE DIFUSORES.             |                       | <b>0.0010</b> |
| H: - PROFUNDIDAD DE VERTIDO. (EN PLEAMAR)     | (m)                   | <b>30.00</b>  |
| n: - N° DE BOCAS DE DIFUSION POR RISER.       |                       | <b>1</b>      |
| Kr: - COEF. PERD. LOCALIZADAS EN REDUCCIONES  |                       | <b>0.18</b>   |
| Ks: - COEF. PERD. LOCALIZADAS EN CODOS RISERS |                       | <b>0.00</b>   |
| Kc: - COEF. PERD. LOCALIZADAS ENTRADA RISERS. |                       | <b>0.80</b>   |
| Kd: - COEF. PERD. CINETICA                    |                       | <b>1.000</b>  |
| Kv: - COEF. PERD. LOCALIZADAS EN VALVULAS     |                       | <b>0</b>      |



**DISTRIBUCION DE CAUDALES DE SALIDA EN EL DIFUSOR.**

oct-07

|               | (m)                        | (m)                        | (m)                      | (m)                     | (m/s)                       | (m³/s)                   | (m/s)                      | (m³/s)                  |
|---------------|----------------------------|----------------------------|--------------------------|-------------------------|-----------------------------|--------------------------|----------------------------|-------------------------|
| DIFUSOR<br>Nº | PROFUND.<br>DIFUSOR<br>hi. | DIAMETRO<br>DIFUSOR<br>Di. | DIAMETRO<br>RISER<br>di. | DIAMETRO<br>BOCA<br>si. | VELOCIDAD<br>DIFUSOR<br>vi. | CAUDAL<br>DIFUSOR<br>Qi. | VELOCIDAD<br>SALIDA<br>ci. | CAUDAL<br>SALIDA<br>qi. |
| 0             | 30.00                      | 0.150                      | 0.060                    | 0.060                   | 0.56                        | 0.010                    | 3.484                      | 0.010                   |
| 1             | 29.99                      | 0.250                      | 0.060                    | 0.060                   | 0.40                        | 0.020                    | 3.501                      | 0.010                   |
| 2             | 29.99                      | 0.250                      | 0.060                    | 0.060                   | 0.60                        | 0.030                    | 3.506                      | 0.010                   |
| 3             | 29.98                      | 0.300                      | 0.060                    | 0.060                   | 0.56                        | 0.040                    | 3.516                      | 0.010                   |
| 4             | 29.97                      | 0.300                      | 0.060                    | 0.060                   | 0.70                        | 0.050                    | 3.522                      | 0.010                   |
| 5             | 29.97                      | 0.300                      | 0.060                    | 0.060                   | 0.84                        | 0.060                    | 3.533                      | 0.010                   |
| 6             | 29.96                      | 0.350                      | 0.060                    | 0.060                   | 0.72                        | 0.070                    | 3.548                      | 0.010                   |
| 7             | 29.96                      | 0.350                      | 0.060                    | 0.060                   | 0.83                        | 0.080                    | 3.557                      | 0.010                   |
| 8             | 29.95                      | 0.350                      | 0.060                    | 0.060                   | 0.93                        | 0.090                    | 3.569                      | 0.010                   |
| 9             | 29.94                      | 0.400                      | 0.060                    | 0.060                   | 0.79                        | 0.100                    | 3.583                      | 0.010                   |

**PERDIDAS DE CARGA EN EL DIFUSOR.**

oct-07

|               | (m/s)                       | (m.c.a.)                   | (m/s)                       | (m/s)                      | (m.c.a.)                   |                          |
|---------------|-----------------------------|----------------------------|-----------------------------|----------------------------|----------------------------|--------------------------|
| DIFUSOR<br>Nº | VELOCIDAD<br>DIFUSOR<br>vi. | PERDIDAS<br>FRICCION<br>H1 | VELOCIDAD<br>ELEVADOR<br>ui | VELOCIDAD<br>SALIDA<br>ci. | PERDIDAS<br>LOCALIZ.<br>H2 | Nº<br>FROUDE<br>EN BOCAS |
| 0             | 0.56                        | 0.0165                     | 3.48                        | 3.48                       | 1.1137                     | 27.4                     |
| 1             | 0.40                        | 0.0044                     | 3.50                        | 3.50                       | 1.1245                     | 27.5                     |
| 2             | 0.60                        | 0.0098                     | 3.51                        | 3.51                       | 1.1274                     | 27.5                     |
| 3             | 0.56                        | 0.0066                     | 3.52                        | 3.52                       | 1.1339                     | 27.6                     |
| 4             | 0.70                        | 0.0104                     | 3.52                        | 3.52                       | 1.1382                     | 27.7                     |
| 5             | 0.84                        | 0.0150                     | 3.53                        | 3.53                       | 1.1450                     | 27.8                     |
| 6             | 0.72                        | 0.0090                     | 3.55                        | 3.55                       | 1.1548                     | 27.9                     |
| 7             | 0.83                        | 0.0118                     | 3.56                        | 3.56                       | 1.1607                     | 27.9                     |
| 8             | 0.93                        | 0.0149                     | 3.57                        | 3.57                       | 1.1684                     | 28.0                     |
| 9             | 0.79                        | 0.0091                     | 3.58                        | 3.58                       | 1.1781                     | 28.2                     |

**TOTAL PERDIDAS POR FRICCION** 0.0716

|                                   |
|-----------------------------------|
| PERDIDAS DE CARGA EN EL EMISARIO. |
|-----------------------------------|

oct-07

**1. Tramo conducción principal.**

|                        |       |           |
|------------------------|-------|-----------|
| .- Longitud Tubería    | 2,133 | m         |
| .- Diámetro Tubería.   | 0.400 | m         |
| .- Velocidad Efluente. | 0.80  | Mts./Seg. |
| .- Número de Manning.  | 0.010 |           |

**2.91**

**2. Pérdidas en Tramo Difusor.**

|                                |       |
|--------------------------------|-------|
| - Fricción                     | 0.072 |
| - Reducciones                  | 0.018 |
| - Elevadores, codos y válvulas | 1.114 |

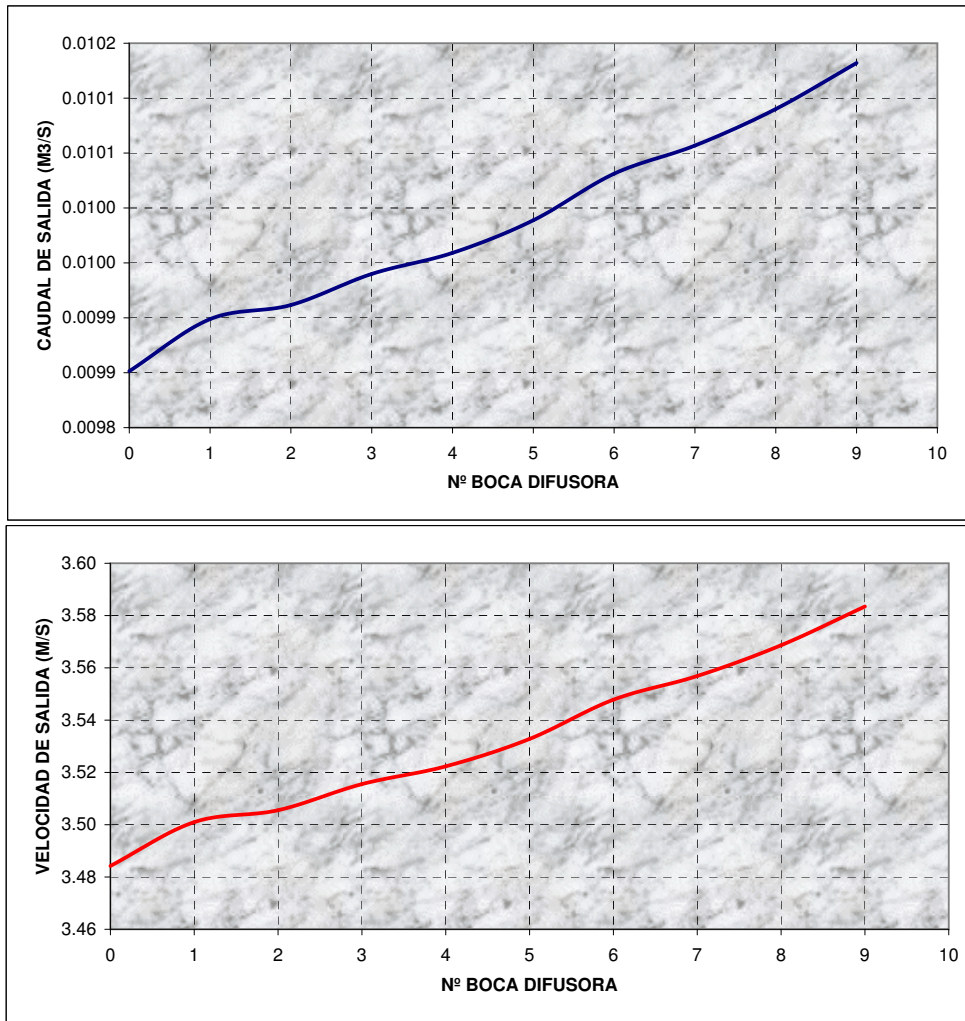
**1.20**

**3. Pérdidas por Diferencia de Densidades.**

**0.93**

|                                  |
|----------------------------------|
| TOTAL PERDIDAS DE CARGA (m.c.a.) |
|----------------------------------|

|      |
|------|
| 5.05 |
|------|



**CALCULO HIDRAULICO DE EMISARIOS.**

oct-07

**Emisario D' En Bossa (Ibiza). Conduccion FC****PARAMETROS BASICOS**

|   |                       |               |
|---|-----------------------|---------------|
| Q: - CAUDAL DE CALCULO.                       | (m <sup>3</sup> /s)   | <b>0.150</b>  |
| M: - NUMERO DE MANNING                        |                       | <b>0.010</b>  |
| Pe: - PESO ESPECIFICO DEL EFLUENTE.           | (kgs/m <sup>3</sup> ) | <b>995</b>    |
| Pew: - PESO ESPECIFICO DEL AGUA DE MAR.       | (kgs/m <sup>3</sup> ) | <b>1026</b>   |
| s: - SEPARACION ENTRE DIFUSORES.              | (m)                   | <b>6.67</b>   |
| m: - PENDIENTE ZONA DE DIFUSORES.             |                       | <b>0.0010</b> |
| H: - PROFUNDIDAD DE VERTIDO. (EN PLEAMAR)     | (m)                   | <b>30.00</b>  |
| n: - N° DE BOCAS DE DIFUSION POR RISER.       |                       | <b>1</b>      |
| Kr: - COEF. PERD. LOCALIZADAS EN REDUCCIONES  |                       | <b>0.18</b>   |
| Ks: - COEF. PERD. LOCALIZADAS EN CODOS RISERS |                       | <b>0.00</b>   |
| Kc: - COEF. PERD. LOCALIZADAS ENTRADA RISERS. |                       | <b>0.80</b>   |
| Kd: - COEF. PERD. CINETICA                    |                       | <b>1.000</b>  |
| Kv: - COEF. PERD. LOCALIZADAS EN VALVULAS     |                       | <b>0</b>      |

**DISTRIBUCION DE CAUDALES DE SALIDA EN EL DIFUSOR.**

oct-07

|               | (m)                        | (m)                        | (m)                      | (m)                     | (m/s)                       | (m³/s)                   | (m/s)                      | (m³/s)                  |
|---------------|----------------------------|----------------------------|--------------------------|-------------------------|-----------------------------|--------------------------|----------------------------|-------------------------|
| DIFUSOR<br>Nº | PROFUND.<br>DIFUSOR<br>hi. | DIAMETRO<br>DIFUSOR<br>Di. | DIAMETRO<br>RISER<br>di. | DIAMETRO<br>BOCA<br>si. | VELOCIDAD<br>DIFUSOR<br>vi. | CAUDAL<br>DIFUSOR<br>Qi. | VELOCIDAD<br>SALIDA<br>ci. | CAUDAL<br>SALIDA<br>qi. |
| 0             | 30.00                      | 0.150                      | 0.060                    | 0.060                   | 0.84                        | 0.015                    | 5.227                      | 0.015                   |
| 1             | 29.99                      | 0.250                      | 0.060                    | 0.060                   | 0.60                        | 0.030                    | 5.252                      | 0.015                   |
| 2             | 29.99                      | 0.250                      | 0.060                    | 0.060                   | 0.91                        | 0.044                    | 5.259                      | 0.015                   |
| 3             | 29.98                      | 0.300                      | 0.060                    | 0.060                   | 0.84                        | 0.059                    | 5.274                      | 0.015                   |
| 4             | 29.97                      | 0.300                      | 0.060                    | 0.060                   | 1.05                        | 0.074                    | 5.284                      | 0.015                   |
| 5             | 29.97                      | 0.300                      | 0.060                    | 0.060                   | 1.26                        | 0.089                    | 5.299                      | 0.015                   |
| 6             | 29.96                      | 0.350                      | 0.060                    | 0.060                   | 1.08                        | 0.104                    | 5.322                      | 0.015                   |
| 7             | 29.96                      | 0.350                      | 0.060                    | 0.060                   | 1.24                        | 0.119                    | 5.335                      | 0.015                   |
| 8             | 29.95                      | 0.350                      | 0.060                    | 0.060                   | 1.40                        | 0.135                    | 5.353                      | 0.015                   |
| 9             | 29.94                      | 0.400                      | 0.060                    | 0.060                   | 1.19                        | 0.150                    | 5.375                      | 0.015                   |

**PERDIDAS DE CARGA EN EL DIFUSOR.**

oct-07

|               | (m/s)                       | (m.c.a.)                   | (m/s)                       | (m/s)                      | (m.c.a.)                   |                          |
|---------------|-----------------------------|----------------------------|-----------------------------|----------------------------|----------------------------|--------------------------|
| DIFUSOR<br>Nº | VELOCIDAD<br>DIFUSOR<br>vi. | PERDIDAS<br>FRICCION<br>H1 | VELOCIDAD<br>ELEVADOR<br>ui | VELOCIDAD<br>SALIDA<br>ci. | PERDIDAS<br>LOCALIZ.<br>H2 | Nº<br>FROUDE<br>EN BOCAS |
| 0             | 0.84                        | 0.0372                     | 5.23                        | 5.23                       | 2.5068                     | 41.1                     |
| 1             | 0.60                        | 0.0098                     | 5.25                        | 5.25                       | 2.5308                     | 41.3                     |
| 2             | 0.91                        | 0.0221                     | 5.26                        | 5.26                       | 2.5372                     | 41.3                     |
| 3             | 0.84                        | 0.0149                     | 5.27                        | 5.27                       | 2.5515                     | 41.4                     |
| 4             | 1.05                        | 0.0233                     | 5.28                        | 5.28                       | 2.5612                     | 41.5                     |
| 5             | 1.26                        | 0.0337                     | 5.30                        | 5.30                       | 2.5764                     | 41.6                     |
| 6             | 1.08                        | 0.0202                     | 5.32                        | 5.32                       | 2.5981                     | 41.8                     |
| 7             | 1.24                        | 0.0265                     | 5.34                        | 5.34                       | 2.6113                     | 41.9                     |
| 8             | 1.40                        | 0.0336                     | 5.35                        | 5.35                       | 2.6284                     | 42.1                     |
| 9             | 1.19                        | 0.0204                     | 5.37                        | 5.37                       | 2.6501                     | 42.2                     |

**TOTAL PERDIDAS POR FRICCION** 0.1612

|                                   |
|-----------------------------------|
| PERDIDAS DE CARGA EN EL EMISARIO. |
|-----------------------------------|

oct-07

**1. Tramo conducción principal.**

|                        |       |           |
|------------------------|-------|-----------|
| .- Longitud Tubería    | 2,133 | m         |
| .- Diámetro Tubería.   | 0.400 | m         |
| .- Velocidad Efluente. | 1.19  | Mts./Seg. |
| .- Número de Manning.  | 0.010 |           |

**6.55**

**2. Pérdidas en Tramo Difusor.**

|                                |       |
|--------------------------------|-------|
| - Fricción                     | 0.161 |
| - Reducciones                  | 0.040 |
| - Elevadores, codos y válvulas | 2.507 |

**2.71**

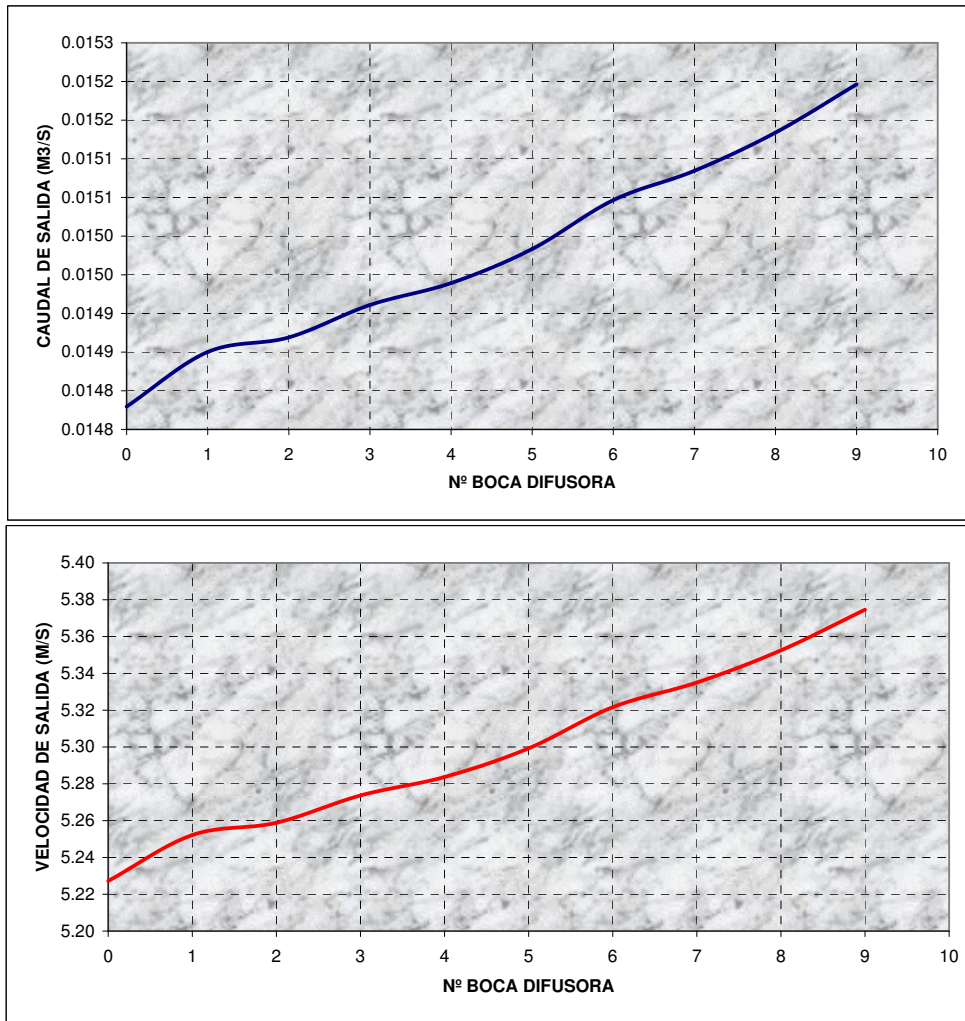
**3. Pérdidas por Diferencia de Densidades.**

**0.93**

|                                  |
|----------------------------------|
| TOTAL PERDIDAS DE CARGA (m.c.a.) |
|----------------------------------|

|       |
|-------|
| 10.19 |
|-------|





**CALCULO HIDRAULICO DE EMISARIOS.**

oct-07

**Emisario D' En Bossa (Ibiza). Conduccion FC****PARAMETROS BASICOS**

|   |          |        |
|---|----------|--------|
| Q: - CAUDAL DE CALCULO.                       | (m³/s)   | 0.200  |
| M: - NUMERO DE MANNING                        |          | 0.010  |
| Pe: - PESO ESPECIFICO DEL EFLUENTE.           | (kgs/m³) | 995    |
| Pew: - PESO ESPECIFICO DEL AGUA DE MAR.       | (kgs/m³) | 1026   |
| s: - SEPARACION ENTRE DIFUSORES.              | (m)      | 6.67   |
| m: - PENDIENTE ZONA DE DIFUSORES.             |          | 0.0010 |
| H: - PROFUNDIDAD DE VERTIDO. (EN PLEAMAR)     | (m)      | 30.00  |
| n: - Nº DE BOCAS DE DIFUSION POR RISER.       |          | 1      |
| Kr: - COEF. PERD. LOCALIZADAS EN REDUCCIONES  |          | 0.18   |
| Ks: - COEF. PERD. LOCALIZADAS EN CODOS RISERS |          | 0.00   |
| Kc: - COEF. PERD. LOCALIZADAS ENTRADA RISERS. |          | 0.80   |
| Kd: - COEF. PERD. CINETICA                    |          | 1.000  |
| Kv: - COEF. PERD. LOCALIZADAS EN VALVULAS     |          | 0      |

**DISTRIBUCION DE CAUDALES DE SALIDA EN EL DIFUSOR.**

oct-07

|               | (m)                        | (m)                        | (m)                      | (m)                     | (m/s)                       | (m³/s)                   | (m/s)                      | (m³/s)                  |
|---------------|----------------------------|----------------------------|--------------------------|-------------------------|-----------------------------|--------------------------|----------------------------|-------------------------|
| DIFUSOR<br>Nº | PROFUND.<br>DIFUSOR<br>hi. | DIAMETRO<br>DIFUSOR<br>Di. | DIAMETRO<br>RISER<br>di. | DIAMETRO<br>BOCA<br>si. | VELOCIDAD<br>DIFUSOR<br>vi. | CAUDAL<br>DIFUSOR<br>Qi. | VELOCIDAD<br>SALIDA<br>ci. | CAUDAL<br>SALIDA<br>qi. |
| 0             | 30.00                      | 0.150                      | 0.060                    | 0.060                   | 1.12                        | 0.020                    | 6.980                      | 0.020                   |
| 1             | 29.99                      | 0.250                      | 0.060                    | 0.060                   | 0.81                        | 0.040                    | 7.013                      | 0.020                   |
| 2             | 29.99                      | 0.250                      | 0.060                    | 0.060                   | 1.21                        | 0.059                    | 7.022                      | 0.020                   |
| 3             | 29.98                      | 0.300                      | 0.060                    | 0.060                   | 1.12                        | 0.079                    | 7.041                      | 0.020                   |
| 4             | 29.97                      | 0.300                      | 0.060                    | 0.060                   | 1.40                        | 0.099                    | 7.055                      | 0.020                   |
| 5             | 29.97                      | 0.300                      | 0.060                    | 0.060                   | 1.69                        | 0.119                    | 7.075                      | 0.020                   |
| 6             | 29.96                      | 0.350                      | 0.060                    | 0.060                   | 1.45                        | 0.139                    | 7.105                      | 0.020                   |
| 7             | 29.96                      | 0.350                      | 0.060                    | 0.060                   | 1.66                        | 0.160                    | 7.123                      | 0.020                   |
| 8             | 29.95                      | 0.350                      | 0.060                    | 0.060                   | 1.87                        | 0.180                    | 7.146                      | 0.020                   |
| 9             | 29.94                      | 0.400                      | 0.060                    | 0.060                   | 1.59                        | 0.200                    | 7.176                      | 0.020                   |

**PERDIDAS DE CARGA EN EL DIFUSOR.**

oct-07

|               | (m/s)                       | (m.c.a.)                   | (m/s)                       | (m/s)                      | (m.c.a.)                   |                          |
|---------------|-----------------------------|----------------------------|-----------------------------|----------------------------|----------------------------|--------------------------|
| DIFUSOR<br>Nº | VELOCIDAD<br>DIFUSOR<br>vi. | PERDIDAS<br>FRICCION<br>H1 | VELOCIDAD<br>ELEVADOR<br>ui | VELOCIDAD<br>SALIDA<br>ci. | PERDIDAS<br>LOCALIZ.<br>H2 | Nº<br>FROUDE<br>EN BOCAS |
| 0             | 1.12                        | 0.0663                     | 6.98                        | 6.98                       | 4.4692                     | 54.8                     |
| 1             | 0.81                        | 0.0175                     | 7.01                        | 7.01                       | 4.5119                     | 55.1                     |
| 2             | 1.21                        | 0.0394                     | 7.02                        | 7.02                       | 4.5233                     | 55.2                     |
| 3             | 1.12                        | 0.0266                     | 7.04                        | 7.04                       | 4.5487                     | 55.3                     |
| 4             | 1.40                        | 0.0416                     | 7.05                        | 7.05                       | 4.5659                     | 55.4                     |
| 5             | 1.69                        | 0.0600                     | 7.08                        | 7.08                       | 4.5928                     | 55.6                     |
| 6             | 1.45                        | 0.0360                     | 7.11                        | 7.11                       | 4.6315                     | 55.8                     |
| 7             | 1.66                        | 0.0472                     | 7.12                        | 7.12                       | 4.6548                     | 56.0                     |
| 8             | 1.87                        | 0.0599                     | 7.15                        | 7.15                       | 4.6853                     | 56.1                     |
| 9             | 1.59                        | 0.0364                     | 7.18                        | 7.18                       | 4.7239                     | 56.4                     |

**TOTAL PERDIDAS POR FRICCION** 0.2874

|  |
|--|
| <b>PERDIDAS DE CARGA EN EL EMISARIO.</b> |
|--|

oct-07

**1. Tramo conducción principal.**

|                        |       |           |       |
|------------------------|-------|-----------|-------|
| .- Longitud Tubería    | 2,133 | m         |       |
| .- Diámetro Tubería.   | 0.400 | m         |       |
| .- Velocidad Efluente. | 1.59  | Mts./Seg. |       |
| .- Número de Manning.  | 0.010 |           |       |
|                        |       |           | 11.64 |

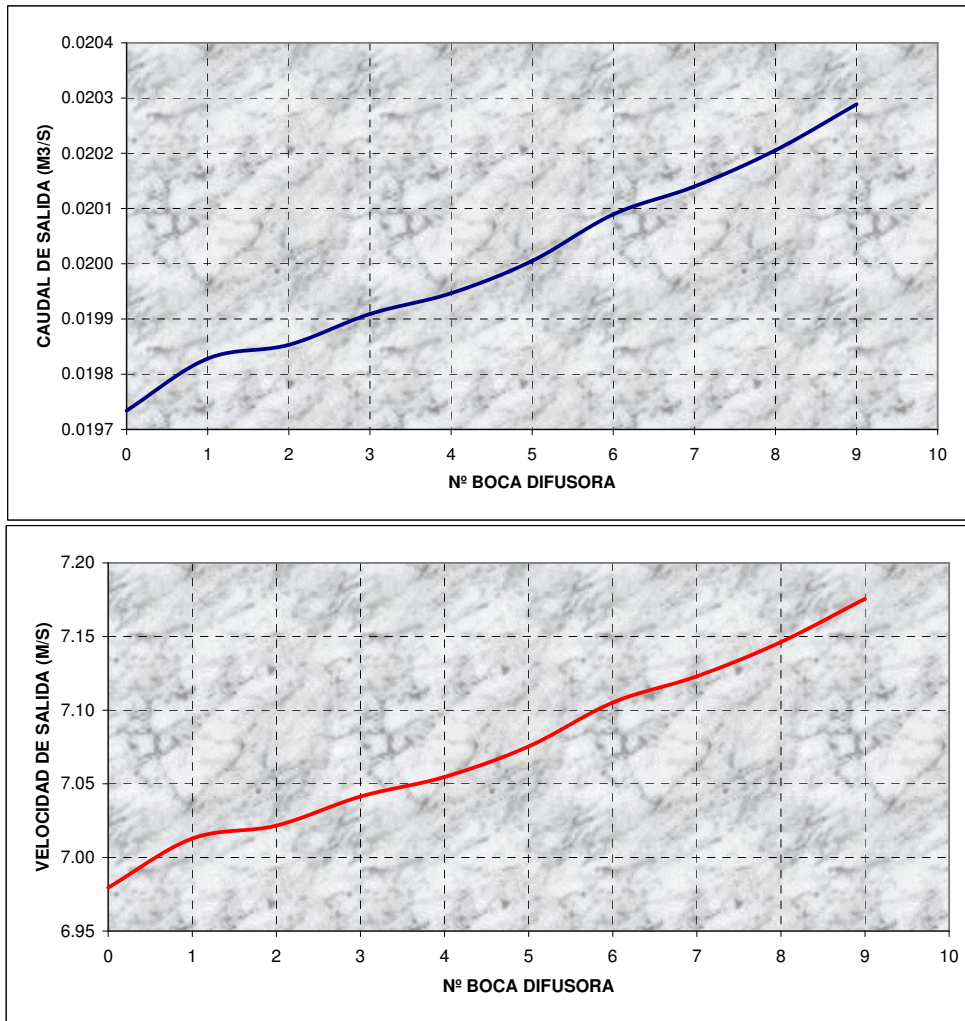
**2. Pérdidas en Tramo Difusor.**

|                                |       |      |
|--------------------------------|-------|------|
| - Fricción                     | 0.287 |      |
| - Reducciones                  | 0.072 |      |
| - Elevadores, codos y válvulas | 4.469 |      |
|                                |       | 4.83 |

|  |             |
|--|-------------|
| <b>3. Pérdidas por Diferencia de Densidades.</b> | <b>0.93</b> |
|--|-------------|

|   |
|---|
| <b>TOTAL PERDIDAS DE CARGA (m.c.a.)</b> |
|---|

|              |
|--------------|
| <b>17.40</b> |
|--------------|



**DOCUMENTO N°2.**  
**ESTUDIO MEDIOAMBIENTAL**





## 1. ANTECEDENTES

La empresa MEDITERRANEO SERVICIOS MARINOS S.L. viene realizando diferentes trabajos encaminados a la adecuación del emisario submarino *d'en Bossa* a la legislación actual en los que se ha procedido al cartografiado de la zona, toma de muestras e inspección directa de la conducción y comunidades afectadas, plasmándose en el "Proyecto de legalización del emisario submarino playa *d'en Bossa* (Ibiza)" en diciembre del 2002.

La depuradora de *Sant Jordi-platja d'en Bossa* entró en funcionamiento en 1992, siendo el sistema de depuración empleado el de fangos activos convencional. El inicio del emisario submarino se halla en la playa *d'en Bossa* situada en el término municipal de *Sant Josep de sa Talaia*, en la costa este de la isla de Ibiza, frente al Parque Natural de *Ses Salines d'Eivissa i Formentera*.

Este parque fue proclamado por el Parlamento Balear en el año 2001 (Ley 17/2001), pero antes de la declaración como Parque Natural contaba con las siguientes figuras jurídicas de protección medioambiental:

- *Reserva natural.*
- *Área Natural de Especial Interés* (ANEI) de la Ley de Espacios Naturales del Gobierno Balear.
- *Zona húmeda* dentro del convenio RAMSAR.
- *Patrimonio de la Humanidad* de la UNESCO.
- *Reserva marina de los Freus.*
- Zona LIC y ZEPA de *Ses Salines d'Eivissa i Formentera* (ES0000084) por la Red Natura 2000 de la Unión Europea.

El punto de vertido está situado dentro del límite marino del Parque Natural de *Ses Salines d'Eivissa i Formentera*, y en el límite exterior del área calificada como LIC y ZEPA por la Red Natura 2000 y de la Reserva Marina *dels Freus*. Además se trata de un emplazamiento catalogado como "masas de agua que requieren un tratamiento adicional al secundario" (*Platja d'en Bossa-Figueretes*), incluida en el Decreto 49/2003, de 9 de mayo, por el cual se declaran las zonas sensibles de las Baleares.

La actual depuradora da servicio a los núcleos urbanos de *Sa Carroca*, *Sant Jordi de Ses Salines* y *platja d'en Bossa*, pero debido al rápido crecimiento turístico, lo que ha favorecido el proceso de concentración de los núcleos urbanos, el dimensionamiento actual de la planta

es insuficiente para atender el incremento de caudales y de cargas contaminantes que conlleva el aumento de población.

La EDAR de *Can Bossa* fue diseñada para un caudal diario de 3.000 m<sup>3</sup> y 16.667 h-e, pero debido a los crecimientos previstos de la población estable y flotante (principalmente en época estival), así como al hecho de realizarse, por parte de esta EDAR, el tratamiento de forma centralizada para todos los residuos de pozos sépticos, fosas sépticas e incluso fangos de pequeñas depuradoras de toda la isla, la planta deberá tratar a medio plazo, casi el doble del caudal actual (aprox. 5.750 m<sup>3</sup>/día y 45.521 h-e) y casi el triple de la carga contaminante, así como el aumento de las cargas influentes de nitrógeno, que exceden a los esperables en aguas residuales domésticas.

El efluente se vierte al mar a través de un emisario submarino que arranca desde la zona sur de la playa *d'en Bossa* y transcurre en sus primeros metros por una zanja parcialmente hormigonada, excavada en una pradera de *Posidonia oceanica* sobre roca. El resto de la conducción transcurre sobre pradera en buen estado hasta el punto de vertido alrededor de los 30 m de profundidad.

Se trata de una tubería de fibrocemento de 400 mm de diámetro y una longitud de 1.662 m de tubería principal y 60 m de difusor en su tramo submarino. En el tramo difusor disminuyen paulatinamente los diámetros del tubo y, de modo alternativo y en la horizontal, se localizan 10 bocas de salida por donde se realiza la descarga.

## **2. MARCO LEGISLATIVO**

### **2.1. LEGISLACIÓN COMUNITARIA**

**Directiva 2006/7/CE, del parlamento Europeo y del Consejo de 15 de febrero de 2006**, relativa a la gestión de la calidad de aguas de baño y por la que se deroga la directiva 76/160/CEE. (DOCE L 64/37, de 4 de marzo de 2006).

**Directiva 2000/60/CE, del parlamento Europeo y del Consejo de 23 de octubre de 2000** por la que se establece un marco comunitario de actuación en el ámbito de la política de aguas (DOCE núm. L 327, de 22 de diciembre de 2000).

**Directiva del Consejo 91/271/CEE, de 21 de mayo de 1991**, sobre el tratamiento de las aguas residuales urbanas (DOCE núm. L 135, de 30 de mayo de 1991).

**Directiva 98/15/CE de la Comisión de 27 de febrero de 1998**, por la que se modifica la Directiva 91/271/CEE del Consejo en relación con determinados requisitos establecidos en su anexo I (DOCE núm. L 67, de 7 de marzo de 1998).

**Directiva 92/43/CEE del Consejo, de 21 de mayo de 1992**, relativa a la conservación de los hábitats naturales y de la fauna y flora silvestre (DOCE núm. L 206, de 22 de julio de 1992).

**Directiva 79/409/CEE del Consejo, de 2 de abril de 1979**, relativa a la conservación de las aves silvestres (DOCE núm. L 103, de 25 de abril de 1979).

### **2.2. LEGISLACIÓN NACIONAL**

**Ley 10/2001 de 5 de julio de la jefatura de Estado**, del Plan Hidrológico Nacional (BOE núm. 161, de 6 de julio de 2001).

**Real Decreto-Ley 11/1995, de 28 de diciembre**, de la Jefatura del Estado, por el que se establecen las normas aplicables al tratamiento de las aguas residuales urbanas (BOE núm. 312, de 30 de diciembre de 1995).

**Real Decreto 509/1996, de 15 de marzo**, de desarrollo del Real Decreto-Ley 11/1995, de 28 de diciembre, por el que se establecen las normas aplicables al tratamiento de las aguas residuales urbanas (BOE núm. 77, de 29 de marzo de 1996).

**Real Decreto 2116/1998, de 2 de octubre**, del Ministerio de Medio Ambiente, por el que se modifica el Real Decreto 509/1996, de 15 de marzo, de desarrollo del Real Decreto –Ley 11/1995, de 28 de diciembre, por el que se establecen las normas aplicables al tratamiento de las aguas residuales urbanas (BOE núm. 251, de 20 de octubre de 1998; c.e. BOE núm. 286, de 30 de noviembre de 1998).

**Real Decreto Legislativo 1/2001**, de 20 de julio, por el que se aprueba el texto refundido de la Ley de Aguas.

**Orden de 13 de julio de 1993**, por la que se aprueba la Instrucción para el proyecto de conducciones de vertidos desde tierra al mar (BOE núm. 178, de 27 de julio de 1993).

**Resolución de 25 de mayo de 1998**, de la Secretaría del Estado de Aguas y Costas del Ministerio de Medio Ambiente, por la que se declaran las <<zonas sensibles>> en las cuencas hidrográficas intercomunitarias (BOE núm. 155, de 30 de junio de 1998; c.e. BOE núm. 189, de 8 de agosto de 1998).

**Ley 4/1989, de 27 de marzo**, de conservación de los espacios naturales y de la flora y fauna silvestres (BOE núm. 74, de 28 de marzo de 1989).

### **2.3. LEGISLACIÓN AUTONÓMICA**

**Real Decreto 378/2001, de 6 de abril**, por el que se aprueba el *Pla Hidrològic de les Illes Balears*.

**Ley 1/1991, de 30 de enero**, de espacios naturales y de régimen urbanístico de las áreas de especial protección de las Islas Baleares (BOE núm. 92, de 17 de abril de 1991).

**Decreto 13/1992, de 13 de febrero de 1992**, sobre evacuación de líquidos procedentes de plantas de tratamiento de aguas residuales urbanas (BOIB núm. 29, de 7 de marzo de 1992; corrección de errores BO Baleares núm. 45 y 126, de 14 de marzo y 17 de octubre de 1992).

**Decret 63/1999, de 28 de maig**, *pel qual s'estableix la reserva marina Dels Freus d'Eivissa i Formentera* (BOCAIB núm. 74, de 8 de junio de 1999).

**Ley de la Comunidad Autónoma de Baleares 17/2001, de 19 de diciembre**, de Protección Ambiental de Ses Salines de Ibiza y Formentera (BOIB núm. 156, de 19 de diciembre de 2001).

**Decret 49/2003, de 9 de maig**, *pel qual es declaren les zones sensibles a les Illes Balears* (BOIB núm. 76, de 29 de mayo de 2003).

**Ley 5/2005, de 26 de mayo**, para la conservación de los espacios de relevancia ambiental (LECO) (BOE núm. 155, de 30 de junio de 2005).

#### **2.4. NORMATIVA DEL PARQUE**

**Acord de Consell de Govern de 24 de maig de 2002**, *pel que s'aprova el Pla d'Ordenació dels Recursos Naturals (PORN) del Parc Natural de Ses Salines de'Eivissa i Formentera*. (BOIB núm. 80, de 4 de julio de 2002)

**Decret 132/2005, de 23 de desembre**, *pel que s'aprova el Pla rector d'ús i gestió (PRUG) del Parc natural de Ses Salines d'Eivissa i Formentera* (BOIB núm. 196, de 31 de desembre de 2005).

#### **2.5. ESTATUS DE PROTECCIÓN DE *Posidonia oceanica***

La importancia de las praderas de *Posidonia oceanica* tanto en el medio marino, como para determinadas actividades humanas, han sido determinantes para conseguir la protección actual de las praderas:

A nivel europeo, *Posidonia oceanica* ha sido incluida en el Anexo I de la **Convención de Berna** como especie de flora estrictamente protegida.

**Directiva** de hábitats de la Unión Europea (**92/42/CEE, de 21 de mayo de 1992**) y su posterior adaptación al progreso técnico y científico a través de la Directiva **97/62/CE de 27 de octubre de 1997**, incluyen a las praderas de *Posidonia oceanica* en el Anexo I, hábitat 1120, como hábitat prioritario a conservar dentro del territorio de la Unión Europea.

El reglamento de pesca de la Unión Europea para el Mediterráneo (**Reglamento CE núm. 1626/94**) prohíbe expresamente la pesca de arrastre sobre praderas de fanerógamas marinas.

En España, el **Real Decreto de 7 de diciembre de 1995** (BOE núm. 310, de 28 de diciembre de 1995) recoge la adaptación de la Directiva de Hábitat al Estado Español. En el se considera a las praderas como sistemas a conservar, para lo cual se establecen medidas para contribuir a garantizar la biodiversidad mediante la conservación de los hábitats naturales y de la fauna y flora silvestres.

### 3. ESTUDIOS PREVIOS

Para definir las repercusiones ambientales que la ampliación de la EDAR *Sant Jordi-platja d'en Bossa*, tiene sobre el medio ambiente donde realiza el vertido, se han definido diferentes líneas de trabajo cuyos resultados se han recogido en los siguientes estudios: Estudio de Diluciones, Cálculo Estructural del emisario y Estudio de Repercusiones Medioambientales del vertido sobre la pradera de *Posidonia oceanica*.

Los dos primeros estudios se han llevado a cabo de forma conjunta mediante un Estudio de Diluciones y Cálculo Estructural del emisario *d'en Bossa*, incluido en el Documento N°1 del presente estudio. En ambos estudios se han analizado diversos casos, con variación de parámetros para tener una visión actual, de futuro cercano y lejano del comportamiento de dicho emisario.

Para el estudio de diluciones se han utilizado dos modelos diferentes de simulación, el modelo *Visjet* y el *Cormix*, para los cuales se han considerado como variables el caudal, el ángulo de incidencia de la corriente y la velocidad de la misma. Se fijaron como valores actuales para el caudal 0.05 m<sup>3</sup>/s y 0.1 m<sup>3</sup>/s y para un futuro cercano y lejano de 0.15 m<sup>3</sup>/s y 0.2 m<sup>3</sup>/s respectivamente. Como ángulos de incidencia de las corrientes estacionarias al difusor se tomó uno con la corriente perpendicular al mismo ( $\gamma=90^\circ$ ) que es la situación usual, y otro con la corriente formando un ángulo ( $\gamma=0^\circ$ ) en dirección a costa, escenario nada habitual pero que es el caso más desfavorable que pueda ocurrir. Y por último se modelizó para dos velocidades de corrientes, 0.1 m/s y 0.2 m/s.

Incluyendo los parámetros medioambientales del medio receptor y la actual estructura del emisario se han realizado simulaciones en las diferentes situaciones para un medio estratificado y uno no estratificado.

Los resultados indican una mejor situación para el caso donde el medio no se encuentre estratificado, recogiendo el dato más desfavorable (dilución de 210 a 20 m) para la simulación 12, con una corriente de 0.2 m/s en dirección a costa y para un caudal de 0.2 m<sup>3</sup>/s.

Para el cálculo hidráulico se han utilizado entre otros datos los valores del caudal actual, de futuro cercano y lejano, considerados para el estudio de diluciones y los parámetros

geométricos del difusor. Obteniendo así, para un caudal máximo de futuro lejano unas pérdidas totales de 17.40 m y una velocidad de auto limpieza de 1.1 m/s.

En resumen, se espera obtener unas diluciones mínimas de 210 y 350 suponiendo un medio estratificado y sin estratificar respectivamente, que superan con creces los valores fijados por la legislación vigente de 80 y 100. Hidráulicamente se establece la idoneidad de la instalación para los nuevos caudales aunque es necesario contemplar una renovación de equipos de bombeo para los máximos caudales en un futuro lejano.

Teniendo en cuenta los datos recogidos por ambos estudios se ha realizado una valoración de los impactos producidos por el vertido sobre la pradera de *Posidonia oceanica* presente en la zona de vertido, y sobre la que transcurre el emisario.



#### **4. GENERALIDADES DE *Posidonia oceanica***

Las fanerógamas marinas conquistaron el medio marino, hace 100 millones de años, formando ecosistemas complejos con múltiples funciones. Estas plantas representan escasamente el 0.02% de la flora angiosperma del planeta, no tienen valor económico como alimento y su utilidad como plantas medicinales o herramientas (aislamiento, ropa,...) está reducida a algunas poblaciones, pero el papel ecológico que juegan estas praderas en la zona costera es considerable.

Las extensas praderas de *P. oceanica* constituyen el ecosistema más emblemático y característico de las costas mediterráneas. Pueden extenderse desde aguas superficiales hasta unos 30-40 m de profundidad en las áreas de aguas más transparentes, como las que bañan el archipiélago balear.

Al igual que el resto de fanerógamas marinas, en la recolonización del medio, llevaron consigo una serie de adaptaciones a un medio mucho más hostil como es el terrestre y que le supone una serie de ventajas ecológicas frente a las algas, sobre todo en la colonización de sustratos vedados tradicionalmente a estos pobladores como es el caso de los fondos sedimentarios. Su distribución no se circunscribe a este tipo de sustrato aunque es en el que presenta su óptimo desarrollo llegando a conformar extensas praderas.

La distribución batimétrica de estas praderas está determinada principalmente por su dependencia a la disponibilidad de luz y por lo tanto de la energía suficiente para desarrollar su actividad fotosintética. La luz se extingue de manera gradual conforme atraviesa la columna de agua por lo que a partir de ciertas profundidades la radiación que llega no es suficiente desde el punto de vista fotosintético y por lo tanto limitando el desarrollo de esta fanerógama a profundidades mayores. Pese a que su distribución está condicionada principalmente por su dependencia a la disponibilidad de luz, también influyen otra serie de factores como son el tipo de sustrato, las condiciones hidrodinámicas, la temperatura del agua de cada zona y el grado de alteración de la franja litoral.

El crecimiento de las praderas de *Posidonia oceanica* se fundamenta en el predominio de un tipo de reproducción vegetativa en forma de estolones frente a la reproducción de tipo sexual, que a diferencia de las fanerógamas terrestres es intermitente y prácticamente vestigial. En este sentido, el desarrollo vegetativo de estas praderas se debe a la existencia de dos tipos de tallos (rizomas) en función de su vector de crecimiento. Por una parte

existen una serie de rizomas con un sentido de crecimiento horizontal que son los responsables de la expansión de la pradera y por lo tanto de la colonización de nuevas áreas. Por otro lado, existe otra serie de rizomas que se caracterizan por presentar un crecimiento vertical y que son los responsables de que la pradera no se entierre debido a la continua deposición de sedimentos. La tasa de crecimiento de estos rizomas es proporcional a la tasa sedimentaria en cada zona hasta ciertos niveles de hipersedimentación a los que esta planta ya no puede responder originándose su enterramiento y su posterior muerte por anoxia de sus tejidos.

La confluencia de los dos patrones de crecimiento de rizoma en una pradera origina un entramado de rizomas y raíces entre los cuales el sedimento es retenido dando lugar a un tipo de sustrato secundario y compacto que se denomina mata. El equilibrio existente entre el desarrollo vertical de la mata y los procesos erosivos de la misma por cuestiones hidrodinámicas origina un paisaje muy heterogéneo desde distintos puntos de vista ambientales y que es la base del asentamiento de una comunidad bionómica muy diversificada.

Todas estas características (morfología, extensión, estructura de la pradera, etc), convierten a *Posidonia oceanica* en la base de un ecosistema altamente productivo y de gran diversidad, y que es considerado como el más maduro de los fondos sedimentarios infralitorales de la cuenca mediterránea.

La importancia de la comunidad de la pradera de *Posidonia oceanica* se evidencia en la multitud de trabajos de investigación de que es objeto y reside tanto en aspectos ecológicos como socioeconómicos. Desde el punto de vista ecológico la importancia es grande por su influencia en una serie de procesos del litoral, sobre los organismos y poblaciones que dependen de ella en todo su ciclo vital o en parte de él, incluidas por supuesto algunas poblaciones de interés pesquero. Es también un importante factor de conservación de la calidad de las aguas, pero sin embargo es muy sensible a los cambios ambientales, de tal manera que se utiliza en ocasiones el estado de conservación de las praderas como indicador de la calidad ambiental de una zona litoral. Desde el punto de vista de la sucesión ecológica, está considerada, por su grado de madurez, como la comunidad climácica de los fondos blandos infralitorales.

La importancia de este ecosistema se centra en multitud de aspectos que vamos a relatar a continuación:

- En primer lugar se trata de un ecosistema caracterizado por presentar una elevada producción primaria de materia orgánica y que es comparable con enclaves tan productivos como la selva amazónica. Esta altísima producción primaria se debe al efecto conjunto de la propia fanerógama como de la diversa población algar que vive asociada a la pradera tanto de manera epífita en las hojas como asentada sobre la propia mata. La canalización de esta producción primaria se origina principalmente a través de las cadenas de detritívoros constituyendo una importante fuente de alimento para los habitantes de la propia pradera y, exportadas a otros lugares, como sustento energético y/o estructural de otras comunidades más alejadas.
- De manera asociada a esta elevada producción primaria, tras el proceso fotosintético, se liberan grandes cantidades de oxígeno a la columna de agua contribuyendo en gran medida a la oxigenación del agua y por lo tanto manteniendo unas condiciones saludables tanto desde el punto de vista ecológico como socioeconómico debido al importante uso turístico de la franja litoral.
- El denso entramado de rizomas que conforman la mata así como la elevada superficie foliar suponen una cantidad ingente de sustrato apto para el asentamiento de una gran diversidad de organismos, constituyendo uno de los fondos marinos más ricos en especies de todo tipo tanto animales como vegetales. La complejidad estructural de la propia pradera origina una diversificación muy elevada de microhábitats y por lo tanto del asentamiento de diversos poblamientos bentónicos adaptados a diferentes condiciones sedimentarias, lumínicas e hidrodinámicas. Gracias a esta compleja estructura espacial se genera una elevadísima diversidad biológica y mucho más importante que en el resto de sustratos blandos no vegetados donde la adaptación es mucho más compleja para la gran mayoría de especies. Las exigencias de la gran cantidad de organismos que pueblan esta comunidad se fundamentan en la necesidad de un asentamiento estable propiamente dicho, de un lugar óptimo para esconderse gracias al heterogéneo relieve que presentan, de un lugar adecuado para afrontar su reproducción y de una disponibilidad nutritiva importante para alimentarse.
- Por otro lado, la complejidad estructural de la pradera, sobre todo desde el punto de vista de la enorme densidad del estrato foliar de la pradera, convierte a esta comunidad en un área importante de *nursery*, o lo que es lo mismo en una zona de refugio para formas larvarias y juveniles de gran cantidad de especies, muchas de ellas de interés

comercial desde el punto de vista pesquero. En estas zonas, la mortalidad de los juveniles es notablemente menor que sobre los sedimentos no vegetados. De esta manera se puede considerar a la pradera de *Posidonia oceanica* como un importante productor de poblaciones adultas gracias a la preservación de las fases juveniles. Estas poblaciones adultas se exportarán hacia las comunidades adyacentes e incluso a zonas más lejanas.

- Otra importancia de la pradera de *Posidonia* radica en su capacidad para estabilizar y fijar el sedimento. El denso entramado de rizomas que caracterizan a la mata de la pradera actúa como una estructura de fijación y compactación del sedimento que es retenido entre sus intersticios a diferencia de los sustratos carentes de pradera que son mucho más móviles e inestables frente a acontecimientos hidrodinámicos. De esta manera se minimiza el efecto erosivo sobre estos sustratos por parte de los grandes temporales. Por otra parte, el estrato foliar actúa como filtro facilitando la sedimentación de las partículas que quedan retenidas en el entramado de rizomas. De esta manera, podemos catalogar a la pradera de *Posidonia* como un sumidero de sedimento.
- En relación con el punto anterior, podemos decir que la pradera actúa como un elemento fundamental en la protección de la costa y sobre todo de las playas, de la erosión marina. En este sentido, las praderas suponen un freno al hidrodinamismo ya que amortiguan el efecto del oleaje a su paso por sus superficies. Esta circunstancia acontece gracias a las hojas, con una morfología acintada, y a la elevación del fondo que origina el crecimiento vertical de la mata. Este efecto se potencia con el hecho de que la pradera actúa como elemento fijador del sedimento impidiendo la regresión de las playas por el efecto erosivo de los acontecimientos hidrodinámicos.
- Desde el punto de vista socioeconómico hemos podido comprobar que las praderas de *Posidonia* repercuten positivamente sobre el sector turístico gracias a la protección frente a la erosión que confieren sobre un bien tan importante como son las playas. No obstante, su importancia también es valorada por otros sectores económicos como es el sector pesquero. Las praderas de *Posidonia* se caracterizan porque muchas de las especies de interés pesquero concentran parte o la totalidad de su ciclo vital sobre las praderas de *Posidonia*. Este es el caso de especies tan apreciadas como es la sepia, el salmonete o el lenguado. Por este motivo, la conservación de estas praderas es muy importante para preservar la riqueza pesquera asociada e indirectamente para mantener

los niveles de explotación pesquera de zonas más alejadas gracias a la exportación desde la pradera.

Muchos estudios que se han realizado sobre la pradera de *Posidonia* desde el punto de vista biológico y/o ecológico ha puesto de manifiesto la preocupante regresión que están experimentando la mayoría de las praderas de *Posidonia*. Su fragilidad ecológica derivada del alto grado de madurez de la comunidad asociada y su consiguiente sensibilidad a las modificaciones inducidas por el hombre en el medio marino, están provocando la regresión generalizada de las praderas en el Mediterráneo a causa de las diversas actuaciones antropogénicas que se vienen realizando en las últimas décadas.

El hecho de que sean plantas de muy lento crecimiento (en especial cuando se acercan a su límite profundo de distribución, es decir, cuando la profundidad limita la cantidad de luz incidente) supone que, a escala de la vida humana, los daños producidos pueden ser difíciles de restituir.

Ante esta regresión generalizada experimentada a lo largo de todo el Mediterráneo hay que puntualizar que diversos estudios abogan por la existencia de una regresión generalizada de carácter climático que se sumaría de manera puntual a las regresiones potenciadas por la incidencia de factores antropogénicos. Esta circunstancia nos indica que las praderas de *Posidonia oceanica* tuvieron un óptimo de distribución a tiempo geológico cuando los condicionantes ambientales fueron más propicios para su desarrollo.

Aunque las amenazas a la conservación de las praderas en nuestro litoral provienen de la actividad humana, se han detectado factores naturales que suponen la muerte de áreas más o menos extensas de praderas de *Posidonia oceanica*. Este tipo de degradación de origen natural suele tener una incidencia puntual como es el sobrepastoreo por herbívoros, el enterramiento por efecto de las riadas o el arranque generalizado de haces por los temporales.

Los vertidos de aguas residuales se realizan directamente desde costa o a través de emisarios submarinos y pueden ser de diferente índole dependiendo de la actividad antropogénica que los genere. Entre ellos podemos encontrarlos de origen urbano, industrial o agrícola. Estos vertidos si se realizan sin depurar o directamente sobre la pradera de *Posidonia* originan un incremento de la materia orgánica y nutrientes sobre la pradera, los cuales a su vez originan el crecimiento desmesurado de epífitos e indirectamente la

sobreexplotación por parte de los macrohervívoros. Por otra parte, se incrementan los niveles de turbidez tanto por la materia en suspensión como por la proliferación del fitoplancton y originando en consecuencia la disminución de la disponibilidad lumínica y por lo tanto de la capacidad fotosintética de las plantas. Es por esto que una mala gestión en los procesos de depuración de los residuos urbanos podría tener consecuencias negativas para el ecosistema, para lo que se hace necesario implementar diferentes procesos de depuración que garanticen la calidad de estos vertidos.

## 5. VALORACIÓN DE LOS IMPACTOS PRODUCIDOS POR EL VERTIDO

La importancia de las praderas de *Posidonia oceanica* y su reconocimiento ha impulsado los estudios sobre su ecología, y principalmente sobre el efecto que la contaminación que el agua produce sobre ellas, ya que para desarrollarse las praderas de *Posidonia* necesitan aguas de buena calidad, no contaminadas, transparentes y bien oxigenadas.

La presencia de altas concentraciones en el efluente de parámetros como los sólidos en suspensión, la materia orgánica o los nutrientes, puede implicar la modificación del medio cercano al punto de vertido, por lo que se hace necesaria la descripción de los parámetros que pueden llegar a afectar a la vitalidad de las praderas de *Posidonia oceanica*.

El efecto que los Sólidos en Suspensión (SS) ejercen sobre esta planta a elevadas concentraciones se relaciona con el aumento de la turbidez del agua, lo que disminuye la penetración de la luz favoreciendo la regresión de las praderas (*Bourcier, 1980*). Además, la propia deposición de las partículas provoca el progresivo enterramiento de la planta si se supera la velocidad de crecimiento vertical de la misma.

Por otro lado está demostrada la relación existente entre la cantidad de nutrientes (principalmente nitrógeno y fósforo) presentes en el medio y el crecimiento y morfología de *Posidonia* (*Pergent, Mendez, Pergent-Martini & Pasqualini, 1998*). Así, en un momento inicial un aumento en la concentración de nutrientes podría ser un factor positivo ya que favorece el crecimiento de las hojas, pero también aumenta la biomasa de epífitos y por lo tanto el herbivorismo, lo que conlleva una disminución de la densidad de haces. Además los epífitos hacen que las hojas sean poco funcionales y con el tiempo disminuya su crecimiento debido al atrapamiento de la luz. De igual forma, el aumento de la concentración de nutrientes favorece el crecimiento del fitoplancton y de las macroalgas ejerciendo el mismo efecto de sombra que la concentración de sólidos en suspensión

Como parámetros indicativos de la cantidad de materia orgánica presente en el agua se utiliza la DBO<sub>5</sub> (Demanda Bioquímica de Oxígeno) y la DQO (Demanda Química de Oxígeno). El primer parámetro determina la cantidad de oxígeno consumido en un periodo de 5 días por las bacterias aerobias para reducir la materia orgánica presente en un volumen determinado de agua. De esta forma la presencia de valores elevados de DBO indican contaminación y la aparición de procesos de eutrofización. Y el segundo parámetro determina la cantidad de oxígeno expresado en mg/l consumido por las materias oxidables

en las condiciones de ensayo, contenida en 1l de agua. Esta determinación no representa lo que realmente ocurre en la naturaleza, y sobre todo no hace distinción entre sustancias biodegradables y no biodegradables.

La elevada concentración de materia orgánica en el agua implica un alto consumo de oxígeno y la posible aparición de situaciones de anoxia. Además parte de esta materia orgánica es incorporada al sedimento, para cuya descomposición se requiere oxígeno, pudiendo producir un déficit de oxígeno en el sustrato. Según estudios realizados (*Delgado, Ruiz, Pérez, Romero & Ballesteros, 1998*) el incremento de los periodos de hipoxia en el sedimento puede interferir con el metabolismo del nitrógeno y por lo tanto afectar al crecimiento y vitalidad de esta planta.

Una vez caracterizados los principales contaminantes capaces de generar un impacto negativo sobre las praderas de *Posidonia*, realizaremos una valoración de los efectos de los contaminantes establecidos según la legislación vigente en materia de vertidos de aguas residuales y su cumplimiento por parte del vertido realizado a través del emisario de la EDAR de Sant Jordi-platja d'en Bossa.

Según la Directiva 91/271/CEE, de 21 de mayo de 1991, sobre el tratamiento de las aguas residuales urbanas, transpuesta al ordenamiento interno por el Real Decreto-Ley 11/1995 de 28 de diciembre, se establecen los requisitos para los vertidos procedentes de instalaciones de tratamiento de aguas residuales urbanas (tabla 5.1), para lo cual se aplicará el valor de concentración o el porcentaje de reducción.

|            | Parámetros de concentración | Porcentaje de reducción |
|------------|-----------------------------|-------------------------|
| <b>DBO</b> | 25 mg/l                     | 70%-90%                 |
| <b>DQO</b> | 125 mg/l                    | 75%                     |
| <b>SS</b>  | 35 mg/l                     | 90%                     |

**Tabla 5.1.** Criterios de calidad de agua de vertidos urbanos según la Directiva 91/271/CEE y el Real Decreto-Ley 11/1995.

Aplicando estos parámetros de calidad a los datos sobre el efluente, suministrados por la Agencia Balear del Agua (Tabla 5.3), podemos comprobar que el efluente proveniente de la EDAR de Sant Jordi-platja d'en Bossa cumple con los valores de concentración o los porcentajes de reducción para todos los parámetros indicados en la Directiva 91/271/CEE y el Decreto-Ley 11/1995.



Por otro lado según el decreto 49/2003, de 9 de mayo, por el que se declaran las zonas sensibles de las Baleares, se considera la *platja d'en Bossa-Figueretes* una zona sensible como “masas de agua que requieren un tratamiento adicional al secundario”, categoría que en este caso hace referencia a la Directiva 2006/7/CE relativa a la gestión de la calidad de las aguas de baño, y por lo que en temporada de baño, según información aportada por el la Agencia Balear del Agua, se procede a la desinfección del efluente.

En el contexto de la eliminación de nutrientes, según el Artículo 50.3 apartado e, del Plan Hidrológico de las Islas Baleares, aprobado por el Real Decreto 378/2001 de 6 de abril, todos los vertidos de carácter urbano o asimilables a urbanos, con una carga contaminante superior a 15.000 habitantes equivalente, deberán contar en el primer horizonte del Plan con sistemas avanzados de eliminación de nutrientes, con rendimientos mínimos del 75% y 80% en la eliminación de nitrógeno y fósforo totales respectivamente.

Por último, teniendo en cuenta que el punto de vertido del emisario proveniente de la EDAR se encuentra dentro del Parque Natural de Ses Salines de Ibiza y Formentera, y que este se encuentra regulado por un Plan de Ordenación de los Recursos Naturales propio, es necesario destacar el artículo 34 de dicho Plan, el cual establece las limitaciones en el parque y las zonas periféricas, quedando prohibidos según el apartado a, de este mismo artículo, los vertidos que se hagan directa o indirectamente al mar, a los torrentes y a tierra, salvo que hayan pasado por un ciclo de depuración terciaria que haga que los parámetros de calidad sean aceptables según el Plan hidrológico de las Islas Baleares y que tengan la autorización correspondiente de la administración hidráulica.

En la actualidad no se están cumpliendo los rendimientos mínimos establecidos por el citado Plan debido a que el tratamiento actual no puede cumplir los requisitos de eliminación de nutrientes, por lo que se presenta necesario implementar los procesos de tratamiento de nutrientes con objeto de garantizar el cumplimiento del Plan Hidrológico de las Baleares. El proyecto de “Ampliación y mejora de tratamiento de la EDAR de Platja d'en Bossa”, actualmente en fase de tramitación, se ha redactado al objeto de solventar dicha situación.

A continuación se presentan en una tabla los datos suministrados por la Agencia Balear del Agua, donde se reflejan los caudales mensuales, además de los datos de salida de la EDAR y los porcentajes de reducción que se consiguen de forma mensual, desde enero de 2006 hasta julio de 2007, para los cinco parámetros indicativos de la calidad del efluente.

| AÑO  | MES        | CAUDAL (m <sup>3</sup> ) | PARÁMETROS DE CONCENTRACIÓN<br>(mg/l) |      |     |        |                   | PORCENTAJES DE<br>REDUCCIÓN (%) |     |    |      |     |
|------|------------|--------------------------|---------------------------------------|------|-----|--------|-------------------|---------------------------------|-----|----|------|-----|
|      |            |                          | DBOs                                  | DQOs | SSs | NTs    | PO <sub>4</sub> s | DBO                             | DQO | SS | NT   | P   |
| 2006 | Enero      | 40740                    | 11                                    | 55   | 18  | 21,012 | 1,3               | 96                              | 88  | 95 | 66   | -86 |
|      | Febrero    | 43749                    | 6                                     | 85   | 23  | 57,1   | 1,1               | 98                              | 80  | 94 | 19   | 77  |
|      | Marzo      | 47072                    | 20                                    | 54   | 17  | 9,5    | 0,8               | 94                              | 82  | 90 | 52   | 70  |
|      | Abril      | 65800                    | 24                                    | 91   | 36  | 32,275 | 2,4               | 92                              | 79  | 91 | -53  | 51  |
|      | Mayo       | 80210                    | 25                                    | 71   | 21  | 9,525  | 1,2               | 88                              | 81  | 92 | 0    | 97  |
|      | Junio      | 95500                    | 19                                    | 96   | 233 | 41,985 | 9,4               | 95                              | 93  | 71 | -103 | 15  |
|      | Julio      | 98604                    | 26                                    | 79   | 124 | 55,013 | 6,5               | 93                              | 94  | 92 | 39   | 17  |
|      | Agosto     | 102125                   | 40                                    | 114  | 163 | 57,012 | 8,6               | 91                              | 92  | 90 | 21   | 11  |
|      | Septiembre | 107927                   | 39                                    | 97   | 137 | 61,016 | 6                 | 92                              | 93  | 90 | -3   | 48  |
|      | Octubre    | 71600                    | 47                                    | 100  | 187 | 61,54  | 7,6               | 92                              | 94  | 90 | 18   | 17  |
|      | Noviembre  | 47400                    | 36                                    | 95   | 53  | 41,029 | 3,3               | 87                              | 81  | 90 | 39   | 31  |
|      | Diciembre  | 39200                    | 15                                    | 62   | 18  | 41,997 | 0,4               | 88                              | 85  | 90 | 13   | 60  |
| 2007 | Enero      | 41342                    | 11                                    | 110  | 29  | 27,99  | 0,5               | 97                              | 91  | 97 | 76   | 92  |
|      | Febrero    | 83405                    | 25                                    | 79   | 35  | 44,96  | 1,2               | 89                              | 96  | 99 | 45   | 78  |
|      | Marzo      | 69525                    | 22                                    | 124  | 30  | 48,044 | 0,8               | 93                              | 91  | 96 | 38   | 93  |
|      | Abril      | 78537                    | 50                                    | 126  | 95  | 84,953 | 3,2               | 90                              | 90  | 90 | -65  | 43  |
|      | Mayo       | 92220                    | 86                                    | 114  | 168 | 39,049 | 4                 | 83                              | 85  | 92 | 0    | 38  |
|      | Junio      | 106050                   | 83                                    | 206  | 97  | 97,42  | 10                | 76                              | 83  | 90 | -33  | 1   |
|      | Julio      | 147520                   | 79                                    | 290  | 110 | 91,07  | 4,8               | 81                              | 75  | 82 | 14   | 9   |

**Tabla 5.3.** Datos mensuales de los parámetros de calidad del efluente proporcionados por la Agencia Balear del Agua.

## 6. CONCLUSIONES

Las praderas de *Posidonia oceanica* son comunidades muy sensibles a determinadas actuaciones humanas, particularmente aquellas que alteran la transparencia de las aguas o los cambios en el equilibrio sedimentológico del litoral (*Cambridge, 1975; Kemp et al, 1983; Cambridge et al, 1986; Carke & Firman, 1989; Shepherd et al, 1989; Burkholder et al, 1992*), por lo que es necesario conseguir minimizar los impactos que sufren.

El hecho confirmado del aumento de población estable y flotante en los municipios, de los caudales de vertido y de la carga contaminante a medio y largo plazo, hace necesaria la ampliación de la EDAR. De esta forma, una vez finalizadas las obras de adecuación y mejora de las instalaciones, se conseguirá un efluente de mejor calidad, que cumplirá en cualquier caso la normativa vigente en relación a la calidad de las aguas de vertido y a la protección de *Posidonia oceanica*.

De acuerdo con los estudios realizados consideramos las siguientes conclusiones:

- **No se observa la necesidad de modificar el diseño del emisario submarino actual, ya que su estructura y funcionalidad es suficiente para soportar los caudales previstos para el futuro.**
- Según la memoria del proyecto de “Ampliación y mejora del tratamiento de la depuradora de Sant Jordi-Platja d'en Bossa (T.M. de Sant Joseph de Sa Talaia, Ibiza”, **la ejecución del mismo permitirá alcanzar los objetivos de calidad legalmente establecidos, así como hacer frente a los crecimientos de población y caudal propios de esta aglomeración urbana.**
- **Para el seguimiento del funcionamiento de las instalaciones se establecerá por parte de la Comunidad Autónoma (Direcció General de Qualitat Ambiental i Litoral) las condiciones generales y particulares del vertido, y se obligará a la redacción y posterior cumplimiento de un Plan de Vigilancia y Control específico y periódico para el control del medio receptor y del efluente, convirtiéndose en una potente herramienta para el seguimiento del funcionamiento de las instalaciones.**