# ISGAS ENERGIT MULTIUTILITIES S.p.A.

Sede Legale Via Italia n° 167 – 09100 Cagliari

L'Amministratore Delegato: Dott. Giuseppe Deroma

## TERMINAL GNL NEL PORTO CANALE DI CAGLIARI
## PROGETTO AUTORIZZATIVO

TERMINAL GNL NEL PORTO CANALE DI CAGLIARI
PROGETTO AUTORIZZATIVO

## Progettazione

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**Rapporto preliminare di sicurezza**
Società ICARO S.r.l.

**Opere antincendio**
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**Opere Strutturali**
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Ing. Antonio Dedoni

# MODULO 3 - ANALISI DEL RISCHIO - ALLEGATO 3.4 - REPORT SIMULAZIONI (PHAST)

## 7 - RAPPORTO PRELIMINARE DI SICUREZZA

| NOME FILE | FORMATO |
|---|---|
| D_07_RI_33_ADR_R01 | |
| CODICE ELAB. D 07 RI 33 ADR R01 REV. B | A4 |

| REV. | DESCRIZIONE | DATA | REDATTO | VERIFICATO | APPROVATO |
|---|---|---|---|---|---|
| B | EMISSIONE A SEGUITO RICHIESTA INTEGRAZIONI DEL COMANDO PROVINCIALE DEI VIGILI DEL FUOCO DI CAGLIARI PROT.: *dipvvf.COM-CA.REGISTRO UFFICIALE.U.0020503.13-11-2017* | Dicembre 2017 | Cherici | Delitala | Delitala |

# Input Report

## Workspace: 17129I_LNG_rev00

### Top1_Rottura braccio carico_25 mm

Study

17129I_LNG_rev00

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Context of calculations | Selection of context | Weathers to use for this study | Weather folder | |
| | | Parameters to use for this study | Parameter set | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| Toxic parameters | Indoor toxic calculations | Specify the downwind building type | Unselected | |
| | | Building type (downwind building type) | Buildings\Building type | |
| Dispersion | Distances of interest | Distances of interest | | m |

### braccio di carico

Pressure vessel

17129I_LNG_rev00\Top1_Rottura braccio carico_25 mm

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Material | Material | Material | METHANE | |
| | | Specify volume inventory? | No | |
| | | Mass inventory | 1044,8 | kg |
| | | Volume inventory | 2,58059 | m3 |
| | | Material to track | METHANE | |
| | Phase | Specified condition | Pressure/temperature | |
| | | Temperature | -150 | degC |
| | | Pressure (gauge) | 5 | bar |
| | | Fluid state | Liquid | |
| | | Liquid mole fraction | 1 | fraction |

| | | Phase to be released | Liquid | |
|---|---|---|---|---|
| Scenario | Pipe dimensions | Pipe length | | m |
| | Release location | Elevation | 5 | m |
| | | Tank head | 0 | m |
| | | Release height from vessel bottom | | m |
| | Direction | Outdoor release direction | Horizontal | |
| | | Outdoor release angle | 0 | deg |
| Discharge parameters | Model settings | Atmospheric expansion method | Closest to initial conditions | |
| | | Is flashing allowed to the orifice? | Allow flashing in the orifice | |
| | Droplet break-up mechanism | Droplet break-up mechanism - instantaneous | Use flashing correlation | |
| | | Droplet break-up mechanism - continuous | Use flashing correlation | |
| Short pipe | Pipe characteristics | Pipe roughness | 0,0457 | mm |
| | Frequencies | Frequency of bends in pipe | 0 | /m |
| | | Frequency of couplings in pipe | 0 | /m |
| | | Frequency of junctions in pipe | 0 | /m |
| | Frequencies of valves | Frequency of excess flow valves | 0 | /m |
| | | Frequency of non-return valves | 0 | /m |
| | | Frequency of shut-off valves | 0 | /m |
| | Velocity head losses | Excess flow valve velocity head losses | 0 | |
| | | Non-return valve velocity head losses | 0 | |
| | | Shut-off valve velocity head losses | 0 | |
| Time varying releases | Modelling of time-varying leaks and line ruptures | Vacuum relief valve | Operating | |
| | | Vacuum relief valve set point | 0 | bar |
| | Dimensions | Tank shape | | |
| | | Tank height | | m |
| | | Tank width | | m |
| | | Tank length | | m |
| | | Tank diameter | | m |
| | Inventory data | Tank volume | 2,58059 | m3 |
| | | Tank vapour volume | 0 | m3 |
| | | Tank liquid volume | 2,58059 | m3 |

| | | | | |
|---|---|---|---|---|
| | | Tank liquid level | 0 | m |
| | | Maximum vapour release height | | m |
| | | Maximum mass inventory | 1E+09 | kg |
| Dispersion | Dispersion scope | Concentration of interest | | ppm |
| | | Averaging time for concentration of interest | | |
| | | Specify user-defined averaging time | No | |
| | | User defined averaging time | | s |
| | Distances of interest | Distances of interest | | m |
| | Averaging time for reports | ERPG [1 hr] | No | |
| | | IDLH [30 mins] | No | |
| | | STEL [15 mins] | No | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| | Building definition | Specify a release building | No | |
| | | Specified building (release building) | | |
| | | Building wake effect | None | |
| | | Wind or release angle from North | 0 | deg |
| | | Handling of droplets | Not trapped | |
| | | Indoor mass modification factor | 3 | |
| Explosion parameters | Explosion method (Consequence calculations only) | Explosion method | TNT | |
| | Ignition | Supply late ignition location | No ignition location | |
| | | Location of late ignition | | m |
| | Vapour liquid method | Use of explosion mass modification factor | Early and late explosions | |
| | | Explosion mass modification factor | 3 | |
| TNT | TNT parameters | Air or ground burst | Air burst | |
| | | Default TNT explosion efficiency | 0,1 | fraction |
| Fireball | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 3 | |

| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 4; 12,5; 37,5 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Mass modification factor | 3 | |
| | | Fireball maximum exposure duration | 20 | s |
| | Calculation method | Fireball model | Recommended | |
| | | TNO model flame temperature | 1726,85 | degC |
| Jet fire | Jet fire method | Jet fire method | Cone model | |
| | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Rate modification factor | 3 | |
| | | Jet fire maximum exposure duration | 20 | s |
| | Cone model data | Crosswind angle | 0 | deg |
| | | Horizontal options | Use standard method | |
| | | Correlation | Recommended | |
| | Surface emissive power | Calculation method for surface emissive power | Calculate SEP | |
| | | Flame emissive power | | kW/m2 |
| | | Emissivity fraction | | fraction |
| Pool fire | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |

| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Radiative fraction for general fires | 0,4 | fraction |
| | | Pool fire maximum exposure duration | 20 | s |
| Geometry | Geometry | East | 0 | m |
| | | North | 0 | m |

## Leak

Leak

17129I_LNG_rev00\Top1_Rottura braccio carico_25 mm\braccio di carico

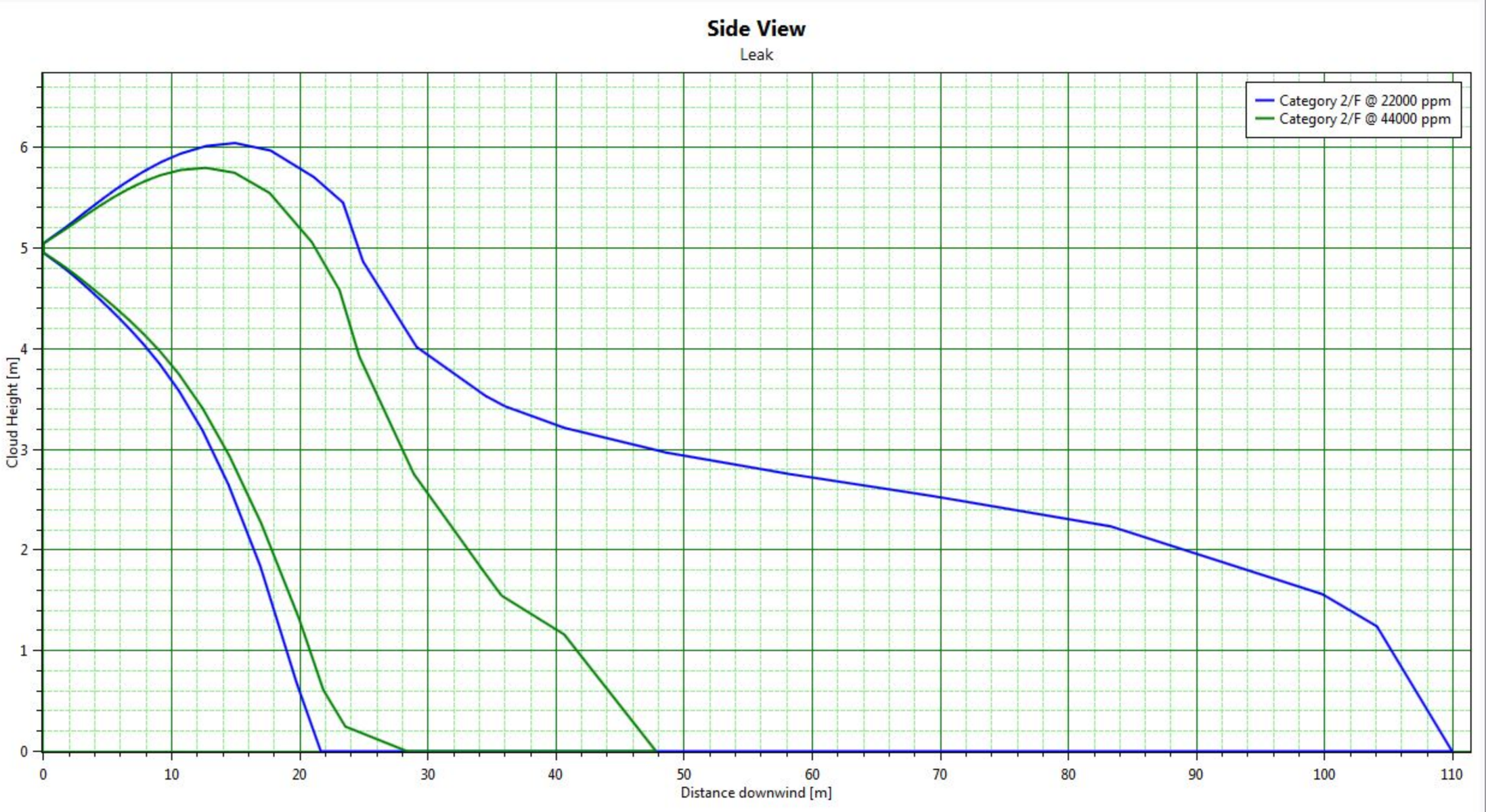
| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Scenario | Hole | Orifice diameter | 25 | mm |
| | | Use specified discharge coefficient? | No | |
| | | Discharge coefficient | | fraction |
| | Release location | Elevation | 5 | m |
| | | Tank head | 0 | m |
| | Direction | Outdoor release direction | Horizontal | |
| | | Outdoor release angle | 0 | deg |
| Material | Material | Material characteristics | Flammable only | |
| | | Material to track | METHANE | |
| | Phase | Phase to be released | Liquid | |
| Discharge parameters | Model settings | Atmospheric expansion method | Closest to initial conditions | |
| | | Is flashing allowed to the orifice? | Allow flashing in the orifice | |
| | Droplet break-up mechanism | Droplet break-up mechanism - continuous | Use flashing correlation | |
| Dispersion | Dispersion scope | Concentration of interest | | ppm |
| | | Averaging time for concentration of interest | | |
| | | Specify user-defined averaging time | No | |

| | | | | |
|---|---|---|---|---|
| | | User defined averaging time | | s |
| | Distances of interest | Distances of interest | | m |
| | Averaging time for reports | ERPG [1 hr] | No | |
| | | IDLH [30 mins] | No | |
| | | STEL [15 mins] | No | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| Toxic parameters | Indoor toxic calculations | Specify the downwind building type | Unselected | |
| | | Building type (downwind building type) | Buildings\Building type | |
| | Exposure time data | Set averaging time equal to exposure time | Use a fixed averaging time | |
| | | Cut-off fraction of toxic load for exposure time calculation | 0,05 | fraction |
| | | Cut-off concentration for exposure time calculations | 0 | fraction |
| | Toxic contours | Number of toxic levels | 4 | |
| | | Dose levels | 130000; 1,3E+06; 1,3E+07; 1,3E+08 | |
| | | Probit levels | 2; 3; 4; 10 | |
| | | Lethality levels | 0,001; 0,01; 0,1; 0,99 | fraction |
| Explosion parameters | Explosion method (Consequence calculations only) | Explosion method | TNT | |
| | Ignition | Supply late ignition location | No ignition location | |
| | | Location of late ignition | | m |
| | Vapour liquid method | Use of explosion mass modification factor | Early and late explosions | |
| | | Explosion mass modification factor | 3 | |
| TNT | TNT parameters | Air or ground burst | Air burst | |
| | | Default TNT explosion efficiency | 0,1 | fraction |
| Fireball | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 3 | |

| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 4; 12,5; 37,5 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Mass modification factor | 3 | |
| | | Fireball maximum exposure duration | 20 | s |
| | Calculation method | Fireball model | Recommended | |
| | | TNO model flame temperature | 1726,85 | degC |
| Jet fire | Jet fire method | Jet fire method | Cone model | |
| | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Rate modification factor | 3 | |
| | | Jet fire maximum exposure duration | 20 | s |
| | Cone model data | Correlation | Recommended | |
| | | Horizontal options | Use standard method | |
| | Surface emissive power | Calculation method for surface emissive power | Calculate SEP | |
| | | Flame emissive power | | kW/m2 |
| | | Emissivity fraction | | fraction |
| Pool fire | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |

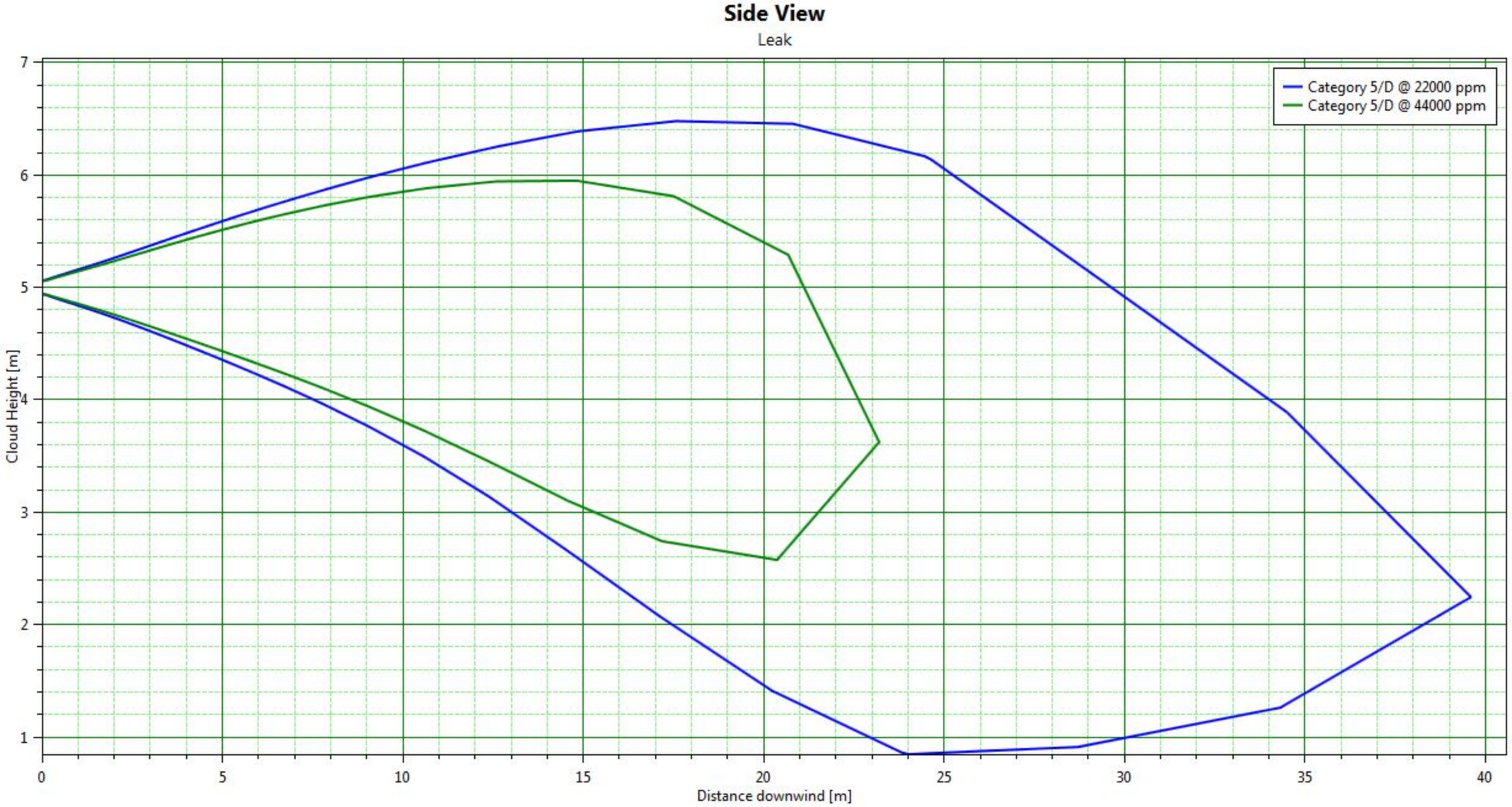
| | | | | |
|---|---|---|---|---|
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Radiative fraction for general fires | 0,4 | fraction |
| | | Pool fire maximum exposure duration | 20 | s |

| | |
|---|---|
| Audit Number | 92412 |
| Averaging time | Flammable (18,75 s) |
| Equipment | braccio di carico |
| Material | METHANE |
| Reference | METHANE |
| Offset Distance | 0 m |
| Program | Phast 7,21 |
| Scenario | Leak |
| Time | 119,26 s |
| Weather | Category 2/F |
| Workspace | 17129I_LNG_rev00 |

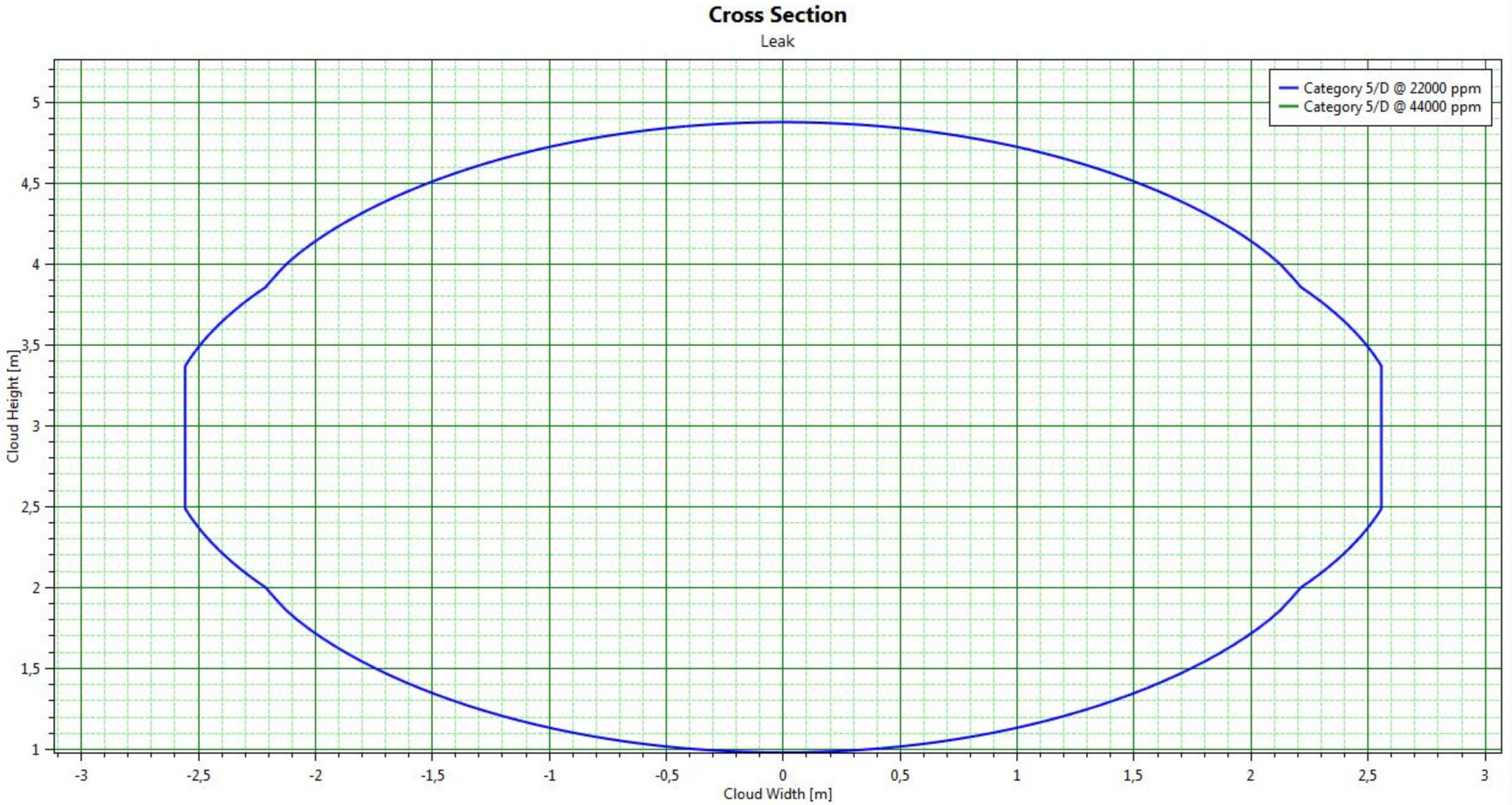


| | |
|---|---|
| Audit Number | 92412 |
| Averaging time | Flammable (18,75 s) |
| Downwind Distance | 50 m |
| Equipment | braccio di carico |
| Material | METHANE |
| Reference | METHANE |
| Program | Phast 7,21 |
| Scenario | Leak |
| Time | 119,26 s |
| Weather | Category 2/F |
| Workspace | 17129I_LNG_rev00 |

| | |
|---|---|
| Audit Number | 92412 |
| Averaging time | Flammable (18,75 s) |
| Equipment | braccio di carico |
| Material | METHANE |
| Reference | METHANE |
| Offset Distance | 0 m |
| Program | Phast 7,21 |
| Scenario | Leak |
| Time | 15,9687 s |
| Weather | Category 5/D |
| Workspace | 17129I_LNG_rev00 |



| | |
|---|---|
| Audit Number | 92412 |
| Averaging time | Flammable (18,75 s) |
| Downwind Distance | 30 m |
| Equipment | braccio di carico |
| Material | METHANE |
| Reference | METHANE |
| Program | Phast 7,21 |
| Scenario | Leak |
| Time | 12,2265 s |
| Weather | Category 5/D |
| Workspace | 17129I_LNG_rev00 |



# Discharge Report

## Workspace: 17129I_LNG_istr_rev01_04

### Study: Top1_Rottura braccio carico_25 mm

#### Equipment Item: braccio di carico_verticale

17129I_LNG_istr_rev01_04\Top1_Rottura braccio carico_25 mm\braccio di carico_verticale

| | | |
|---|---|---|
| Material | **METHANE** | |
| East | 0 | m |
| North | 0 | m |

### Scenario: Leak

17129I_LNG_istr_rev01_04\Top1_Rottura braccio carico_25 mm\braccio di carico_verticale\Leak

#### Weather: Category 2/F

| | |
|---|---|
| **Wind speed [m/s]** | **2** |
| **Pasquill stability** | **F stable - night with moderate clouds and light/moderate wind** |
| **Atmospheric temperature [degC]** | 9,85 |
| **Relative humidity [fraction]** | 0,7 |
| **Solar radiation flux [kW/m2]** | 0,5 |
| **Wind speed at height [m/s]** | **1,36984** |

**Input Data**

**Stagnation Data (data at upstream end for long pipe)**

| | | |
|---|---|---|
| Initial pressure (gauge) | **5** | bar |
| Initial temperature | **-150** | degC |
| Fluid state | **Non-saturated liquid** | |

**Output Data**

**Calculated Quantities**

| | | |
|---|---|---|
| Mass flow rate | 5,80446 | kg/s |
| Release duration | 180 | s |

**Orifice or pipe exit data (before atmospheric expansion)**

| | | |
|---|---|---|
| Orifice pressure | 2,35667 | bar |
| Orifice temperature | -150,136 | degC |
| Vena contracta (exit velocity for pipe releases) | 42,6784 | m/s |
| Discharge coefficient | 0,683969 | |

**Final Data (after atmospheric expansion)**

| | | |
|---|---|---|
| Final temperature | -161,484 | degC |
| Final liquid mass fraction | 0,922895 | fraction |
| Droplet diameter | 250,557 | um |
| Expanded diameter | **0,0646327** | m |
| Final velocity | 79,2965 | m/s |

## Weather: Category 5/D

| | |
|---|---|
| **Wind speed [m/s]** | **5** |
| **Pasquill stability** | **D neutral - little sun and high wind or overcast/windy night** |
| **Atmospheric temperature [degC]** | 9,85 |
| **Relative humidity [fraction]** | 0,7 |
| **Solar radiation flux [kW/m2]** | 0,5 |

| | |
|---|---|
| **Wind speed at height [m/s]** | **4,23555** |

### Input Data

### Stagnation Data (data at upstream end for long pipe)

| | | |
|---|---|---|
| Initial pressure (gauge) | **5** | bar |
| Initial temperature | **-150** | degC |
| Fluid state | **Non-saturated liquid** | |

### Output Data

### Calculated Quantities

| | | |
|---|---|---|
| Mass flow rate | 5,80446 | kg/s |
| Release duration | 180 | s |

### Orifice or pipe exit data (before atmospheric expansion)

| | | |
|---|---|---|
| Orifice pressure | 2,35667 | bar |
| Orifice temperature | -150,136 | degC |
| Vena contracta (exit velocity for pipe releases) | 42,6784 | m/s |
| Discharge coefficient | 0,683969 | |

### Final Data (after atmospheric expansion)

| | | |
|---|---|---|
| Final temperature | -161,484 | degC |
| Final liquid mass fraction | 0,922895 | fraction |
| Droplet diameter | 250,557 | um |
| Expanded diameter | **0,0646327** | m |

| | | |
|---|---|---|
| Final velocity | 79,2965 | m/s |

# Jet Fire

## Workspace: 17129I_LNG_istr_rev01_04

### Study: Top1_Rottura braccio carico_25 mm

#### Equipment Item: braccio di carico_verticale

17129I_LNG_istr_rev01_04\Top1_Rottura braccio carico_25 mm\braccio di carico_verticale

| | | |
|---|---|---|
| Material | **METHANE** | |
| Material to track | **METHANE** | |
| East | 0 | m |
| North | 0 | m |

### Scenario: Leak

17129I_LNG_istr_rev01_04\Top1_Rottura braccio carico_25 mm\braccio di carico_verticale\Leak

#### Weather: Category 2/F

| | |
|---|---|
| **Wind speed [m/s]** | **2** |
| **Pasquill stability** | **F stable - night with moderate clouds and light/moderate wind** |
| **Atmospheric temperature [degC]** | 9,85 |
| **Relative humidity [fraction]** | 0,7 |
| **Solar radiation flux [kW/m2]** | 0,5 |

**Input Data**

| | |
|---|---|
| Jet fire method | Cone model |

**Output Data**

| | | |
|---|---|---|
| Flame emissive power | 162,06 | kW/m2 |
| Fraction of emissivity | 0,272549 | fraction |
| Jet velocity | 79,2965 | m/s |
| Flame length | 26,1934 | m |
| Frustum length | 25,8189 | m |
| Frustum base width | 0,648826 | m |
| Frustum tip width | 9,49248 | m |
| Frustum lift off distance | 0,3929 | m |

| | | |
|---|---|---|
| Flame length in still air | 36,4223 | m |
| Hole to flame angle | 17,7773 | deg |
| Expanded Diameter | 0,0646327 | m |
| Plane angular rotation | 0 | deg |

**Flame Coordinates**

| X [m] | Z [m] | R [m] | Phi [deg] |
|---|---|---|---|
| 2,40582E-17 | 5,3929 | 0 | 17,7773 |
| 2,40582E-17 | 5,3929 | 0,324413 | 17,7773 |
| 7,883 | 29,979 | 4,74624 | 17,7773 |
| 7,883 | 29,979 | 0 | 17,7773 |

## Radiation Intensity Ellipse Results

**Input Data**

For ellipses 'observer direction' refers to whether inclination is 'fixed' or 'variable'. Orientation is always variable.

| | | |
|---|---|---|
| Observer direction | Variable | |
| Exposure duration | 20 | s |
| Height for calculation of flammable effects | **1,5** | m |

**Output Data**

**Radiation intensity**

| Incident radiation [kW/m2] | Lethality [%] | View factor | Probit | Dose [(W/m2)^Probit N.s] | Downwind semi-axis (A) [m] | Crosswind semi-axis (B) [m] | Offset ratio (D) | Effect distance [m] | Area [m2] |
|---|---|---|---|---|---|---|---|---|---|
| 5 | 0,000174704 | 0,0308527 | 0,360367 | 1.709.491 | 22,711 | 23,9847 | 0,397229 | 31,7325 | 1711,27 |
| 12,5 | 6,52536 | 0,0771319 | 3,48789 | 5.800.162 | Not reached | Not reached | Not reached | n/a | n/a |
| 37,5 | 98,7381 | 0,231396 | 7,23773 | 25.094.924 | Not reached | Not reached | Not reached | n/a | n/a |
| 7 | 0,02405 | 0,0431938 | 1,50883 | 2.677.313 | 11,5155 | 14,9189 | 1,06304 | 23,757 | 539,724 |
| 3 | 0 | 0,0185116 | -1,38321 | 865.119 | 35,4434 | 36,8241 | 0,222025 | 43,3127 | 4100,31 |

## Radiation v Distance Results

### Input Data

| | | |
|---|---|---|
| Maximum distance | 43,3127 | m |
| Observer type radiation modelling flag | Planar | |
| Observer direction | Variable | |
| Height for calculation of flammable effects | **1,5** | m |

### Output Data

| X Coordinates [m] | Incident radiation [kW/m2] | Lethality level [fraction] |
|---|---|---|
| 0 | 5,3338 | 4,96098E-06 |
| 0,883932 | 7,1847 | 0,000334186 |
| 1,76786 | 8,54828 | 0,0024838 |
| 2,6518 | 9,33 | 0,00602876 |
| 3,53573 | 9,67762 | 0,00852566 |
| 4,41966 | 9,7583 | 0,00920512 |
| 5,30359 | 9,69704 | 0,00868561 |
| 6,18752 | 9,56086 | 0,00761151 |
| 7,07145 | 9,39237 | 0,0064283 |
| 7,95539 | 9,36956 | 0,00627982 |
| 8,83932 | 9,5415 | 0,00746755 |
| 9,72325 | 9,61616 | 0,00803449 |
| 10,6072 | 9,62072 | 0,00807019 |
| 11,4911 | 9,59659 | 0,00788275 |
| 12,375 | 9,53295 | 0,00740464 |
| 13,259 | 9,43632 | 0,0067221 |
| 14,1429 | 9,31041 | 0,00590734 |
| 15,0268 | 9,1615 | 0,00504599 |
| 15,9108 | 9,05953 | 0,00451565 |
| 16,7947 | 8,79996 | 0,00336328 |
| 17,6786 | 8,59624 | 0,00263514 |
| 18,5626 | 8,38094 | 0,0020099 |
| 19,4465 | 8,15656 | 0,00149275 |

| | | |
|---|---|---|
| 20,3304 | 7,92535 | 0,00107974 |
| 21,2144 | 7,68936 | 0,000760764 |
| 22,0983 | 7,45044 | 0,000522213 |
| 22,9822 | 7,21023 | 0,000349301 |
| 23,8662 | 6,97021 | 0,000227726 |
| 24,7501 | 6,73167 | 0,000144749 |
| 25,634 | 6,49572 | 8,97342E-05 |
| 26,518 | 6,26333 | 5,42782E-05 |
| 27,4019 | 6,03531 | 3,20498E-05 |
| 28,2858 | 5,81233 | 1,84837E-05 |
| 29,1697 | 5,59495 | 1,04178E-05 |
| 30,0537 | 5,38359 | 5,74202E-06 |
| 30,9376 | 5,17858 | 3,09708E-06 |
| 31,8215 | 4,98016 | 1,63588E-06 |
| 32,7055 | 4,78848 | 8,46819E-07 |
| 33,5894 | 4,60362 | 4,29939E-07 |
| 34,4733 | 4,42561 | 2,14262E-07 |
| 35,3573 | 4,25557 | 1,05412E-07 |
| 36,2412 | 4,091 | 5,0724E-08 |
| 37,1251 | 3,93307 | 2,40159E-08 |
| 38,0091 | 3,78166 | 1,1197E-08 |
| 38,893 | 3,63659 | 0 |
| 39,7769 | 3,49769 | 0 |
| 40,6609 | 3,36477 | 0 |
| 41,5448 | 3,23763 | 0 |
| 42,4287 | 3,11606 | 0 |
| 43,3127 | 2,99985 | 0 |

## Weather: Category 5/D

| | |
|---|---|
| **Wind speed [m/s]** | **5** |
| **Pasquill stability** | **D neutral - little sun and high wind or overcast/windy night** |
| **Atmospheric temperature [degC]** | 9,85 |
| **Relative humidity [fraction]** | 0,7 |
| **Solar radiation flux [kW/m2]** | 0,5 |

### Input Data

| | |
|---|---|
| Jet fire method | Cone model |

### Output Data

| | | |
|---|---|---|
| Flame emissive power | 212,174 | kW/m2 |
| Fraction of emissivity | 0,272549 | fraction |
| Jet velocity | 79,2965 | m/s |
| Flame length | 20,3608 | m |
| Frustum length | 20,1296 | m |
| Frustum base width | 1,00344 | m |
| Frustum tip width | 8,70883 | m |
| Frustum lift off distance | 0,305412 | m |
| Flame length in still air | 36,4223 | m |
| Hole to flame angle | 41,0787 | deg |
| Expanded Diameter | 0,0646327 | m |
| Plane angular rotation | 0 | deg |

### Flame Coordinates

| X [m] | Z [m] | R [m] | Phi [deg] |
|---|---|---|---|
| 1,87011E-17 | 5,30541 | 0 | 41,0787 |
| 1,87011E-17 | 5,30541 | 0,501722 | 41,0787 |
| 13,2271 | 20,4793 | 4,35441 | 41,0787 |
| 13,2271 | 20,4793 | 0 | 41,0787 |

## Radiation Intensity Ellipse Results

### Input Data

For ellipses 'observer direction' refers to whether inclination is 'fixed' or 'variable'. Orientation is always variable.

| | | |
|---|---|---|
| Observer direction | Variable | |
| Exposure duration | 20 | s |
| Height for calculation of flammable effects | **1,5** | m |

### Output Data

### Radiation intensity

| Incident radiation [kW/m2] | Lethality [%] | View factor | Probit | Dose [(W/m2)^Probit N.s] | Downwind semi-axis (A) [m] | Crosswind semi-axis (B) [m] | Offset ratio (D) | Effect distance [m] | Area [m2] |
|---|---|---|---|---|---|---|---|---|---|
| 5 | 0,000174704 | 0,0235655 | 0,360367 | 1.709.491 | 24,8177 | 30,5228 | 0,489369 | 36,9715 | 2379,78 |
| 12,5 | 6,52536 | 0,0589138 | 3,48789 | 5.800.162 | 12,6002 | 15,6732 | 0,940436 | 24,4499 | 620,416 |
| 37,5 | 98,7381 | 0,176741 | 7,23773 | 25.094.924 | Not reached | Not reached | Not reached | n/a | n/a |
| 7 | 0,02405 | 0,0329917 | 1,50883 | 2.677.313 | 16,9534 | 24,252 | 0,869385 | 31,8279 | 1291,68 |
| 3 | 0 | 0,0141393 | -1,38321 | 865.119 | 35,8309 | 40,6823 | 0,325273 | 47,4857 | 4579,44 |

## Radiation v Distance Results

### Input Data

| | | |
|---|---|---|
| Maximum distance | 47,4857 | m |
| Observer type radiation modelling flag | Planar | |
| Observer direction | Variable | |
| Height for calculation of flammable effects | **1,5** | m |

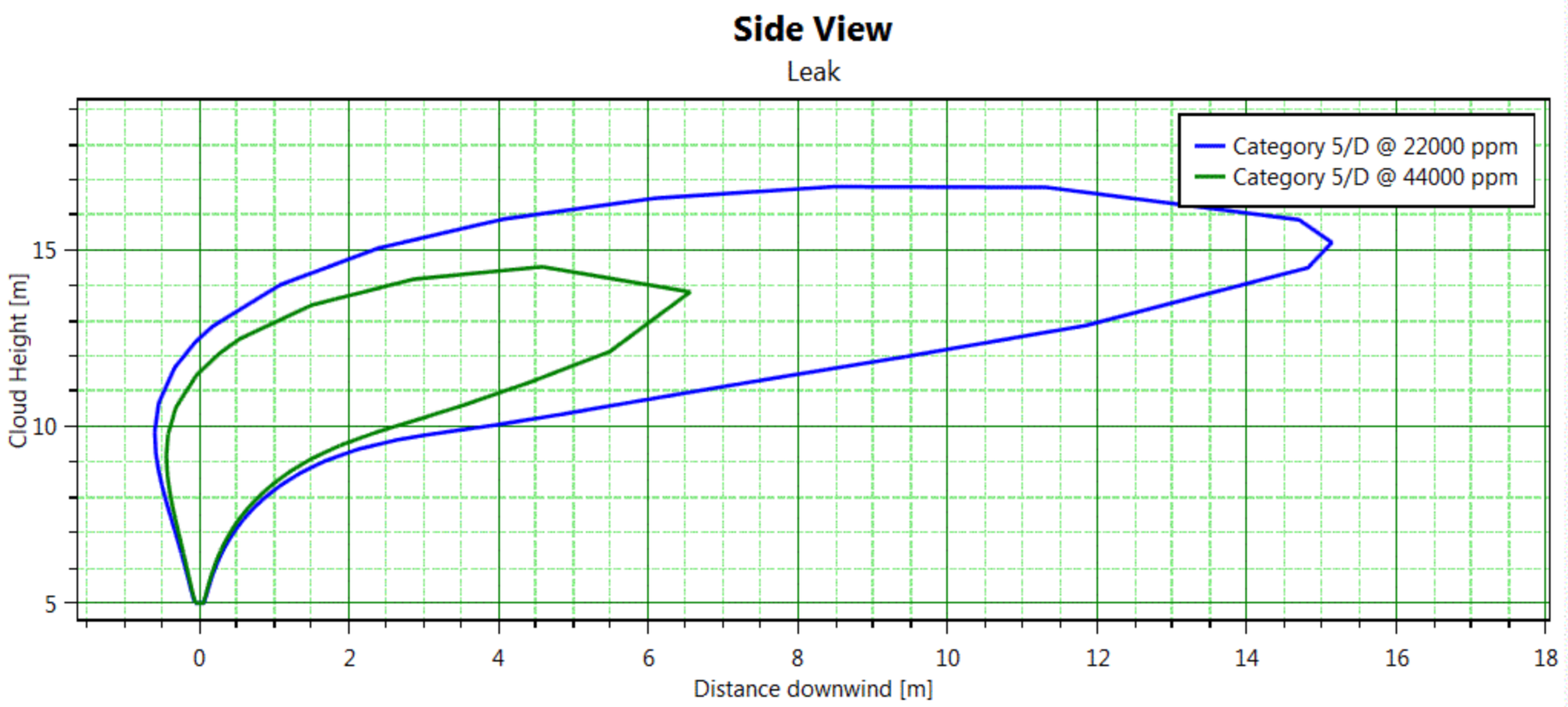
### Output Data

| X Coordinates [m] | Incident radiation [kW/m2] | Lethality level [fraction] |
|---|---|---|
| 0 | 15,4738 | 0,21662 |
| 0,969096 | 18,4259 | 0,425567 |

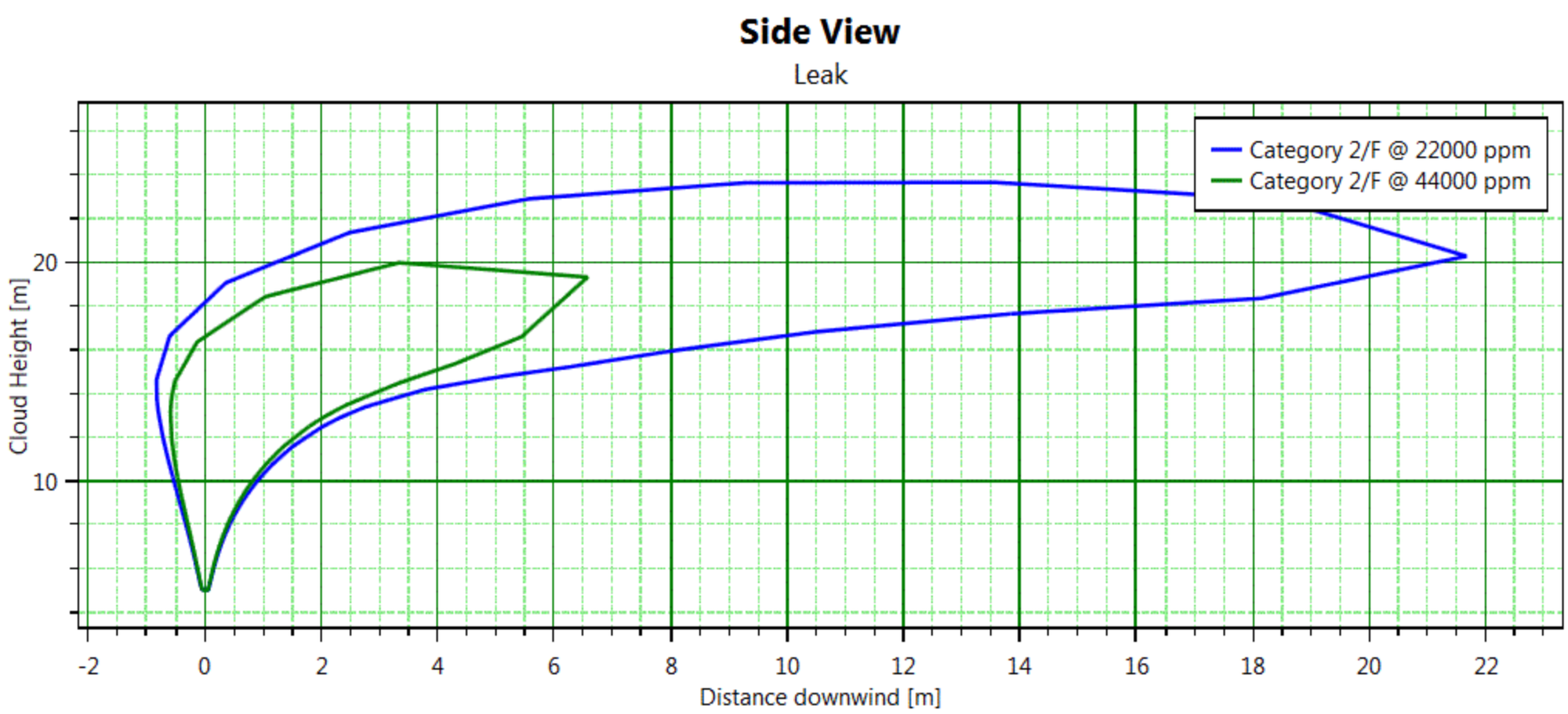
| | | |
|---|---|---|
| 1,93819 | 19,8522 | 0,526634 |
| 2,90729 | 20,0743 | 0,541732 |
| 3,87638 | 21,8746 | 0,654663 |
| 4,84548 | 23,6481 | 0,746662 |
| 5,81457 | 24,9034 | 0,799703 |
| 6,78367 | 25,7074 | 0,828696 |
| 7,75277 | 26,1707 | 0,84375 |
| 8,72186 | 26,3661 | 0,849752 |
| 9,69096 | 26,3364 | 0,848853 |
| 10,6601 | 26,1087 | 0,841801 |
| 11,6291 | 25,7114 | 0,828828 |
| 12,5982 | 25,1549 | 0,809177 |
| 13,5673 | 24,4569 | 0,781954 |
| 14,5364 | 23,6338 | 0,746002 |
| 15,5055 | 22,7029 | 0,70014 |
| 16,4746 | 21,6831 | 0,643535 |
| 17,4437 | 20,5947 | 0,576184 |
| 18,4128 | 19,459 | 0,499413 |
| 19,3819 | 18,2973 | 0,416219 |
| 20,351 | 17,1581 | 0,333239 |
| 21,3201 | 15,975 | 0,249889 |
| 22,2892 | 14,8486 | 0,177636 |
| 23,2583 | 13,7635 | 0,118318 |
| 24,2274 | 12,7294 | 0,0735241 |
| 25,1965 | 11,7531 | 0,0424973 |
| 26,1656 | 10,8386 | 0,0228104 |
| 27,1347 | 9,98781 | 0,0113658 |
| 28,1038 | 9,20059 | 0,00526181 |
| 29,0729 | 8,47544 | 0,00226747 |
| 30,042 | 7,89003 | 0,00102594 |
| 31,0111 | 7,35311 | 0,000445023 |
| 31,9802 | 6,85618 | 0,000184041 |
| 32,9493 | 6,39709 | 7,27848E-05 |
| 33,9183 | 5,97349 | 2,76139E-05 |

| | | |
|---|---|---|
| 34,8874 | 5,58296 | 1,0082E-05 |
| 35,8565 | 5,29612 | 4,43444E-06 |
| 36,8256 | 5,03543 | 1,96251E-06 |
| 37,7947 | 4,78981 | 8,50822E-07 |
| 38,7638 | 4,55598 | 3,58386E-07 |
| 39,7329 | 4,33858 | 1,49875E-07 |
| 40,702 | 4,13396 | 6,16757E-08 |
| 41,6711 | 3,94138 | 2,50087E-08 |
| 42,6402 | 3,7601 | 1,00049E-08 |
| 43,6093 | 3,58943 | 0 |
| 44,5784 | 3,42871 | 0 |
| 45,5475 | 3,27727 | 0 |
| 46,5166 | 3,13458 | 0 |
| 47,4857 | 3,00003 | 0 |

| | |
|---|---|
| Audit Number | 98806 |
| Averaging time | Flammable (18,75 s) |
| Equipment | braccio di carico_verticale |
| Material | METHANE |
| Reference | METHANE |
| Offset Distance | 0 m |
| Program | Phast 7,21 |
| Scenario | Leak |
| Time (Category 5/D) | 2,9459 s |
| Weather | Category 5/D |
| Workspace | 17129I_LNG_istr_rev01_04 |



| | |
|---|---|
| Audit Number | 98806 |
| Averaging time | Flammable (18,75 s) |
| Equipment | braccio di carico_verticale |
| Material | METHANE |
| Reference | METHANE |
| Offset Distance | 0 m |
| Program | Phast 7,21 |
| Scenario | Leak |
| Time (Category 2/F) | 7,79822 s |
| Weather | Category 2/F |
| Workspace | 17129I_LNG_istr_rev01_04 |



# Input Report

## Workspace: 17129I_LNG_rev00

### Top2_Rottura braccio carico ATC_25 mm

Study

17129I_LNG_rev00

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Context of calculations | Selection of context | Weathers to use for this study | Weather folder | |
| | | Parameters to use for this study | Parameter set | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| Toxic parameters | Indoor toxic calculations | Specify the downwind building type | Unselected | |
| | | Building type (downwind building type) | Buildings\Building type | |
| Dispersion | Distances of interest | Distances of interest | | m |

### braccio di carico

Pressure vessel

17129I_LNG_rev00\Top2_Rottura braccio carico ATC_25 mm

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Material | Material | Material | METHANE | |
| | | Specify volume inventory? | No | |
| | | Mass inventory | 1044,8 | kg |
| | | Volume inventory | 2,58059 | m3 |
| | | Material to track | METHANE | |
| | Phase | Specified condition | Pressure/temperature | |
| | | Temperature | -150 | degC |
| | | Pressure (gauge) | 5 | bar |
| | | Fluid state | Liquid | |
| | | Liquid mole fraction | 1 | fraction |

| | | Phase to be released | Liquid | |
|---|---|---|---|---|
| Scenario | Pipe dimensions | Pipe length | | m |
| | Release location | Elevation | 1 | m |
| | | Tank head | 0 | m |
| | | Release height from vessel bottom | | m |
| | Direction | Outdoor release direction | Horizontal | |
| | | Outdoor release angle | 0 | deg |
| Discharge parameters | Model settings | Atmospheric expansion method | Closest to initial conditions | |
| | | Is flashing allowed to the orifice? | Allow flashing in the orifice | |
| | Droplet break-up mechanism | Droplet break-up mechanism - instantaneous | Use flashing correlation | |
| | | Droplet break-up mechanism - continuous | Use flashing correlation | |
| Short pipe | Pipe characteristics | Pipe roughness | 0,0457 | mm |
| | Frequencies | Frequency of bends in pipe | 0 | /m |
| | | Frequency of couplings in pipe | 0 | /m |
| | | Frequency of junctions in pipe | 0 | /m |
| | Frequencies of valves | Frequency of excess flow valves | 0 | /m |
| | | Frequency of non-return valves | 0 | /m |
| | | Frequency of shut-off valves | 0 | /m |
| | Velocity head losses | Excess flow valve velocity head losses | 0 | |
| | | Non-return valve velocity head losses | 0 | |
| | | Shut-off valve velocity head losses | 0 | |
| Time varying releases | Modelling of time-varying leaks and line ruptures | Vacuum relief valve | Operating | |
| | | Vacuum relief valve set point | 0 | bar |
| | Dimensions | Tank shape | | |
| | | Tank height | | m |
| | | Tank width | | m |
| | | Tank length | | m |
| | | Tank diameter | | m |
| | Inventory data | Tank volume | 2,58059 | m3 |
| | | Tank vapour volume | 0 | m3 |
| | | Tank liquid volume | 2,58059 | m3 |

| | | | | |
|---|---|---|---|---|
| | | Tank liquid level | 0 | m |
| | | Maximum vapour release height | | m |
| | | Maximum mass inventory | 1E+09 | kg |
| Dispersion | Dispersion scope | Concentration of interest | | ppm |
| | | Averaging time for concentration of interest | | |
| | | Specify user-defined averaging time | No | |
| | | User defined averaging time | | s |
| | Distances of interest | Distances of interest | | m |
| | Averaging time for reports | ERPG [1 hr] | No | |
| | | IDLH [30 mins] | No | |
| | | STEL [15 mins] | No | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| | Building definition | Specify a release building | No | |
| | | Specified building (release building) | | |
| | | Building wake effect | None | |
| | | Wind or release angle from North | 0 | deg |
| | | Handling of droplets | Not trapped | |
| | | Indoor mass modification factor | 3 | |
| Explosion parameters | Explosion method (Consequence calculations only) | Explosion method | TNT | |
| | Ignition | Supply late ignition location | No ignition location | |
| | | Location of late ignition | | m |
| | Vapour liquid method | Use of explosion mass modification factor | Early and late explosions | |
| | | Explosion mass modification factor | 3 | |
| TNT | TNT parameters | Air or ground burst | Air burst | |
| | | Default TNT explosion efficiency | 0,1 | fraction |
| Fireball | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 3 | |

| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 4; 12,5; 37,5 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Mass modification factor | 3 | |
| | | Fireball maximum exposure duration | 20 | s |
| | Calculation method | Fireball model | Recommended | |
| | | TNO model flame temperature | 1726,85 | degC |
| Jet fire | Jet fire method | Jet fire method | Cone model | |
| | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Rate modification factor | 3 | |
| | | Jet fire maximum exposure duration | 20 | s |
| | Cone model data | Crosswind angle | 0 | deg |
| | | Horizontal options | Use standard method | |
| | | Correlation | Recommended | |
| | Surface emissive power | Calculation method for surface emissive power | Calculate SEP | |
| | | Flame emissive power | | kW/m2 |
| | | Emissivity fraction | | fraction |
| Pool fire | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |

| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Radiative fraction for general fires | 0,4 | fraction |
| | | Pool fire maximum exposure duration | 20 | s |
| Geometry | Geometry | East | 0 | m |
| | | North | 0 | m |

## Leak

Leak

17129I_LNG_rev00\Top2_Rottura braccio carico ATC_25 mm\braccio di carico

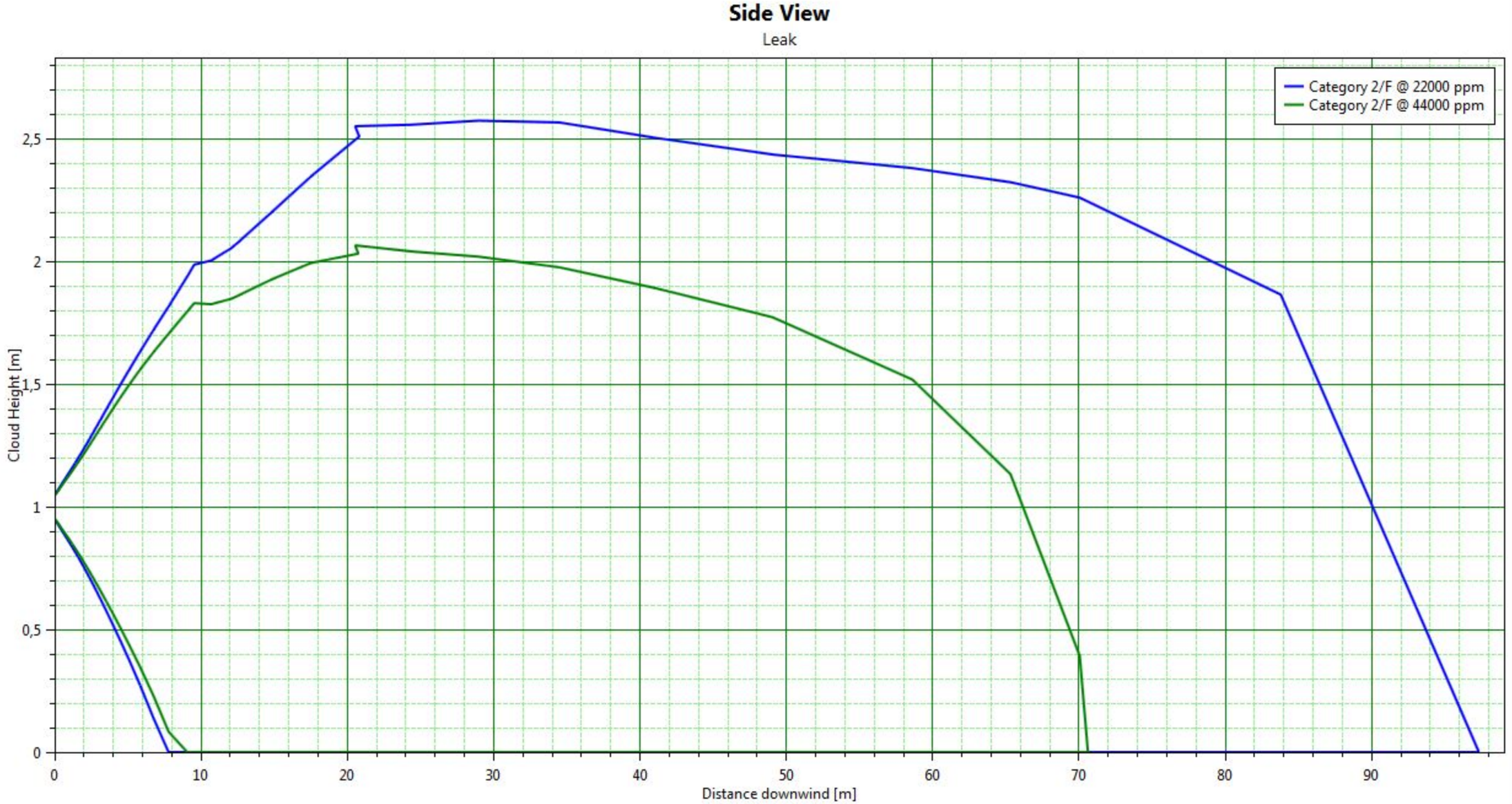
| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Scenario | Hole | Orifice diameter | 25 | mm |
| | | Use specified discharge coefficient? | No | |
| | | Discharge coefficient | | fraction |
| | Release location | Elevation | 1 | m |
| | | Tank head | 0 | m |
| | Direction | Outdoor release direction | Horizontal | |
| | | Outdoor release angle | 0 | deg |
| Material | Material | Material characteristics | Flammable only | |
| | | Material to track | METHANE | |
| | Phase | Phase to be released | Liquid | |
| Discharge parameters | Model settings | Atmospheric expansion method | Closest to initial conditions | |
| | | Is flashing allowed to the orifice? | Allow flashing in the orifice | |
| | Droplet break-up mechanism | Droplet break-up mechanism - continuous | Use flashing correlation | |
| Dispersion | Dispersion scope | Concentration of interest | | ppm |
| | | Averaging time for concentration of interest | | |
| | | Specify user-defined averaging time | No | |

| | | | | |
|---|---|---|---|---|
| | | User defined averaging time | | s |
| | Distances of interest | Distances of interest | | m |
| | Averaging time for reports | ERPG [1 hr] | No | |
| | | IDLH [30 mins] | No | |
| | | STEL [15 mins] | No | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| Toxic parameters | Indoor toxic calculations | Specify the downwind building type | Unselected | |
| | | Building type (downwind building type) | Buildings\Building type | |
| | Exposure time data | Set averaging time equal to exposure time | Use a fixed averaging time | |
| | | Cut-off fraction of toxic load for exposure time calculation | 0,05 | fraction |
| | | Cut-off concentration for exposure time calculations | 0 | fraction |
| | Toxic contours | Number of toxic levels | 4 | |
| | | Dose levels | 130000; 1,3E+06; 1,3E+07; 1,3E+08 | |
| | | Probit levels | 2; 3; 4; 10 | |
| | | Lethality levels | 0,001; 0,01; 0,1; 0,99 | fraction |
| Explosion parameters | Explosion method (Consequence calculations only) | Explosion method | TNT | |
| | Ignition | Supply late ignition location | No ignition location | |
| | | Location of late ignition | | m |
| | Vapour liquid method | Use of explosion mass modification factor | Early and late explosions | |
| | | Explosion mass modification factor | 3 | |
| TNT | TNT parameters | Air or ground burst | Air burst | |
| | | Default TNT explosion efficiency | 0,1 | fraction |
| Fireball | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 3 | |

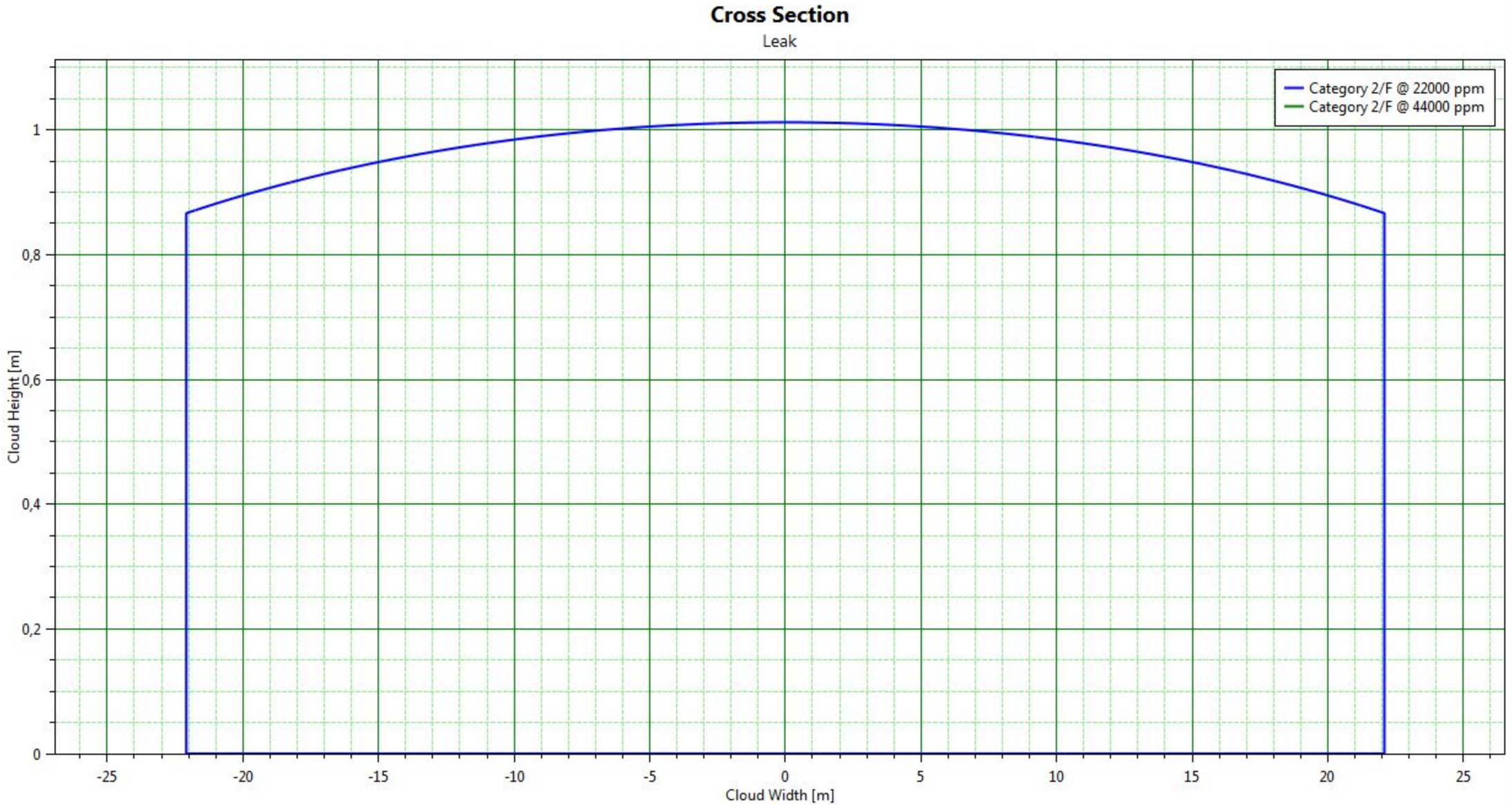
| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 4; 12,5; 37,5 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Mass modification factor | 3 | |
| | | Fireball maximum exposure duration | 20 | s |
| | Calculation method | Fireball model | Recommended | |
| | | TNO model flame temperature | 1726,85 | degC |
| Jet fire | Jet fire method | Jet fire method | Cone model | |
| | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Rate modification factor | 3 | |
| | | Jet fire maximum exposure duration | 20 | s |
| | Cone model data | Correlation | Recommended | |
| | | Horizontal options | Use standard method | |
| | Surface emissive power | Calculation method for surface emissive power | Calculate SEP | |
| | | Flame emissive power | | kW/m2 |
| | | Emissivity fraction | | fraction |
| Pool fire | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |

| | | | | |
|---|---|---|---|---|
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Radiative fraction for general fires | 0,4 | fraction |
| | | Pool fire maximum exposure duration | 20 | s |

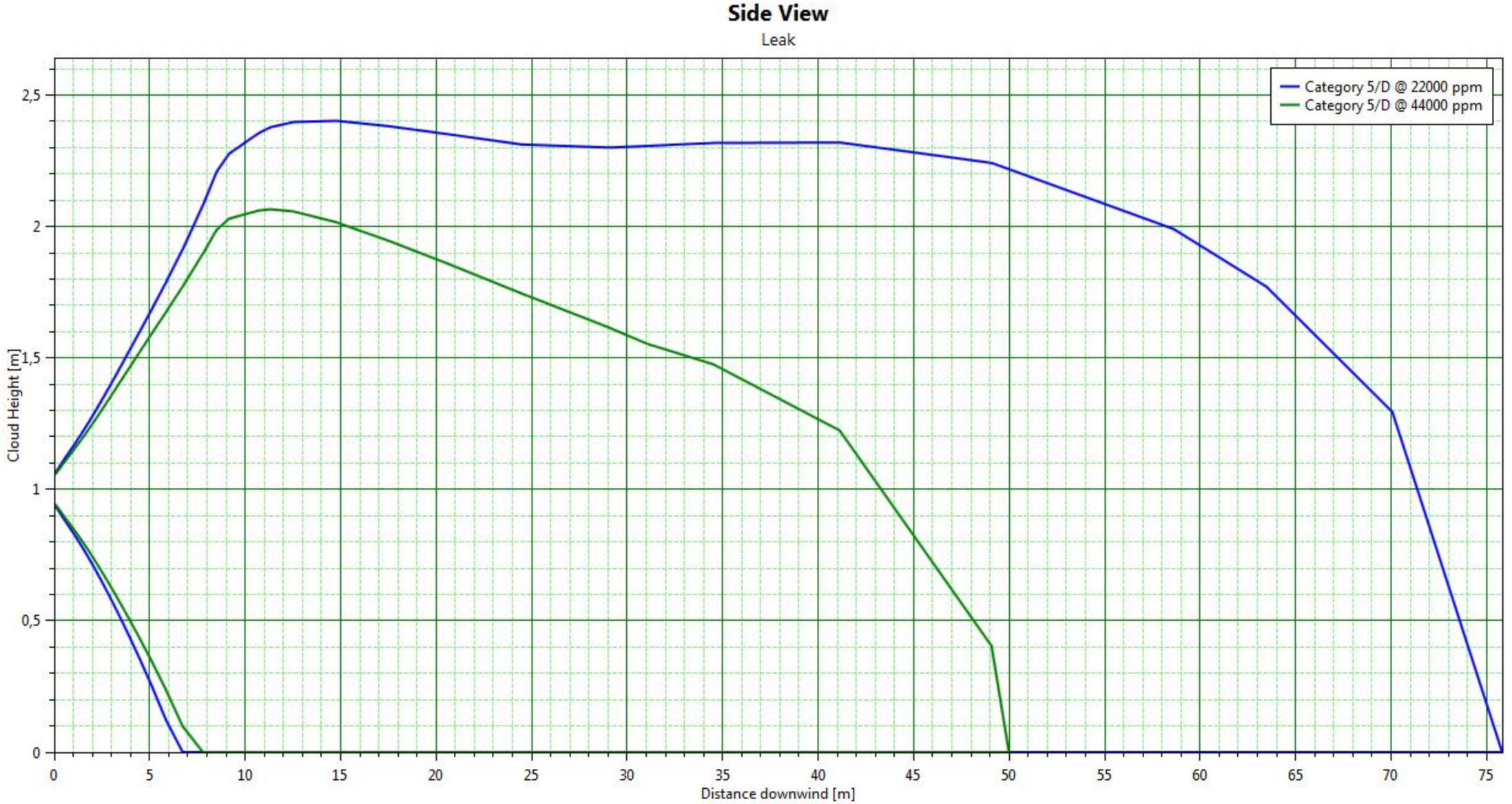
| | |
|---|---|
| Audit Number | 92412 |
| Averaging time | Flammable (18,75 s) |
| Equipment | braccio di carico |
| Material | METHANE |
| Reference | METHANE |
| Offset Distance | 0 m |
| Program | Phast 7,21 |
| Scenario | Leak |
| Time | 91,526 s |
| Weather | Category 2/F |
| Workspace | 17129I_LNG_rev00 |



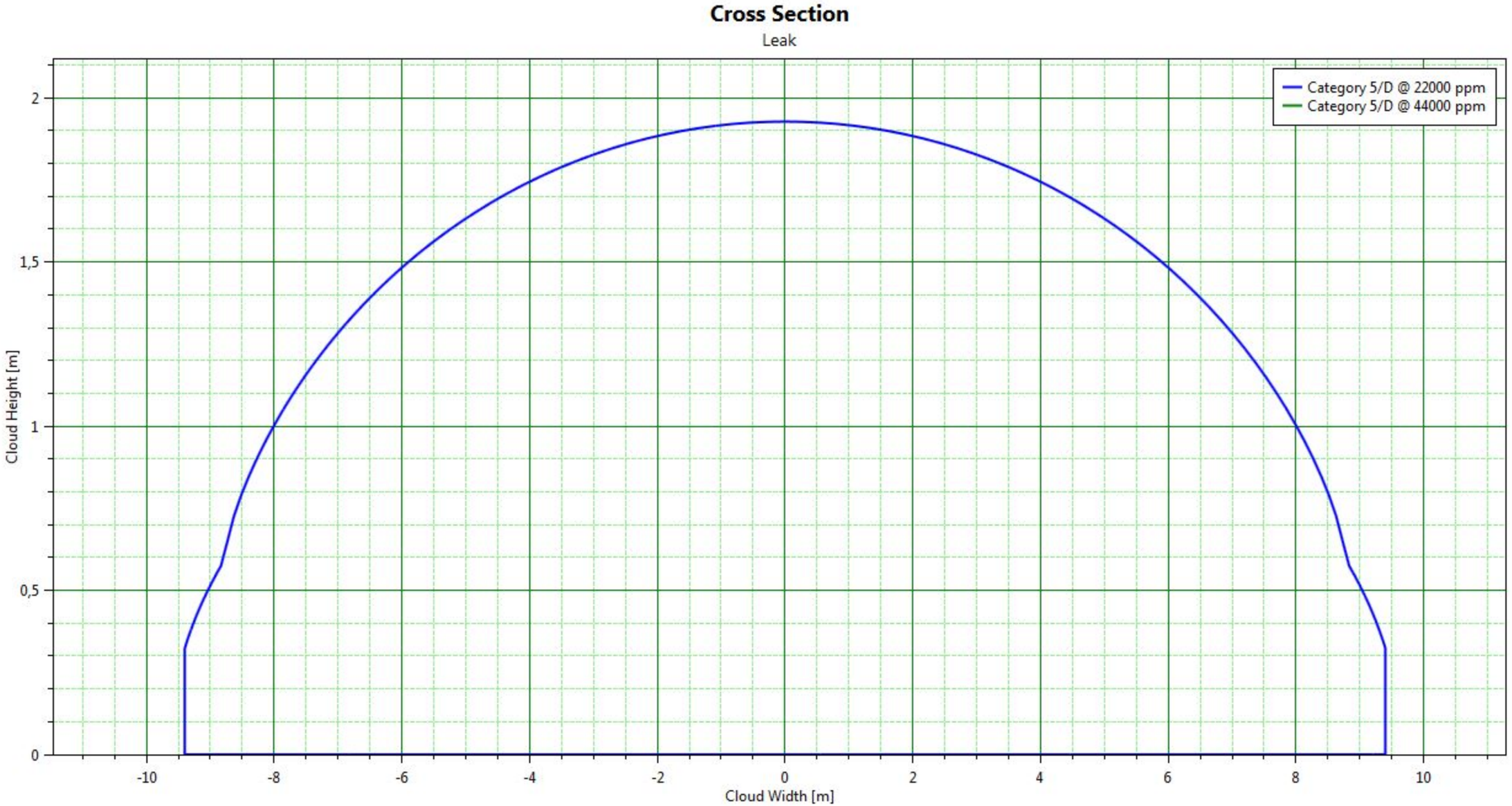
| | |
|---|---|
| Audit Number | 92412 |
| Averaging time | Flammable (18,75 s) |
| Downwind Distance | 90 m |
| Equipment | braccio di carico |
| Material | METHANE |
| Reference | METHANE |
| Program | Phast 7,21 |
| Scenario | Leak |
| Time | 91,526 s |
| Weather | Category 2/F |
| Workspace | 17129I_LNG_rev00 |



| | |
|---|---|
| Audit Number | 92412 |
| Averaging time | Flammable (18,75 s) |
| Equipment | braccio di carico |
| Material | METHANE |
| Reference | METHANE |
| Offset Distance | 0 m |
| Program | Phast 7,21 |
| Scenario | Leak |
| Time | 18,8366 s |
| Weather | Category 5/D |
| Workspace | 17129I_LNG_rev00 |



| | |
|---|---|
| Audit Number | 92412 |
| Averaging time | Flammable (18,75 s) |
| Downwind Distance | 60 m |
| Equipment | braccio di carico |
| Material | METHANE |
| Reference | METHANE |
| Program | Phast 7,21 |
| Scenario | Leak |
| Time | 18,8366 s |
| Weather | Category 5/D |
| Workspace | 17129I_LNG_rev00 |



# Input Report

## Workspace: 17129I_LNG_rev00

### Top3_tubazione banchina_cricca

Study

17129I_LNG_rev00

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Context of calculations | Selection of context | Weathers to use for this study | Weather folder | |
| | | Parameters to use for this study | Parameter set | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| Toxic parameters | Indoor toxic calculations | Specify the downwind building type | Unselected | |
| | | Building type (downwind building type) | Buildings\Building type | |
| Dispersion | Distances of interest | Distances of interest | | m |

### pipe_up

Pressure vessel

17129I_LNG_rev00\Top3_tubazione banchina_cricca

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Material | Material | Material | METHANE | |
| | | Specify volume inventory? | No | |
| | | Mass inventory | 167,169 | kg |
| | | Volume inventory | 0,412895 | m3 |
| | | Material to track | METHANE | |
| | Phase | Specified condition | Pressure/temperature | |
| | | Temperature | -150 | degC |
| | | Pressure (gauge) | 5 | bar |
| | | Fluid state | Liquid | |
| | | Liquid mole fraction | 1 | fraction |

| | | Phase to be released | Liquid | |
|---|---|---|---|---|
| Scenario | Pipe dimensions | Pipe length | | m |
| | Release location | Elevation | 1 | m |
| | | Tank head | 0 | m |
| | | Release height from vessel bottom | | m |
| | Direction | Outdoor release direction | Horizontal | |
| | | Outdoor release angle | 0 | deg |
| Discharge parameters | Model settings | Atmospheric expansion method | Isentropic | |
| | | Is flashing allowed to the orifice? | Allow flashing in the orifice | |
| | Droplet break-up mechanism | Droplet break-up mechanism - instantaneous | Use flashing correlation | |
| | | Droplet break-up mechanism - continuous | Use flashing correlation | |
| Short pipe | Pipe characteristics | Pipe roughness | 0,0457 | mm |
| | Frequencies | Frequency of bends in pipe | 0 | /m |
| | | Frequency of couplings in pipe | 0 | /m |
| | | Frequency of junctions in pipe | 0 | /m |
| | Frequencies of valves | Frequency of excess flow valves | 0 | /m |
| | | Frequency of non-return valves | 0 | /m |
| | | Frequency of shut-off valves | 0 | /m |
| | Velocity head losses | Excess flow valve velocity head losses | 0 | |
| | | Non-return valve velocity head losses | 0 | |
| | | Shut-off valve velocity head losses | 0 | |
| Time varying releases | Modelling of time-varying leaks and line ruptures | Vacuum relief valve | Operating | |
| | | Vacuum relief valve set point | 0 | bar |
| | Dimensions | Tank shape | | |
| | | Tank height | | m |
| | | Tank width | | m |
| | | Tank length | | m |
| | | Tank diameter | | m |
| | Inventory data | Tank volume | 0,412895 | m3 |
| | | Tank vapour volume | 0 | m3 |
| | | Tank liquid volume | 0,412895 | m3 |

| | | | | |
|---|---|---|---|---|
| | | Tank liquid level | 0 | m |
| | | Maximum vapour release height | | m |
| | | Maximum mass inventory | 1E+09 | kg |
| Dispersion | Dispersion scope | Concentration of interest | 19390 | ppm |
| | | Averaging time for concentration of interest | Flammable | |
| | | Specify user-defined averaging time | No | |
| | | User defined averaging time | | s |
| | Distances of interest | Distances of interest | | m |
| | Averaging time for reports | ERPG [1 hr] | No | |
| | | IDLH [30 mins] | No | |
| | | STEL [15 mins] | No | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| | Building definition | Specify a release building | No | |
| | | Specified building (release building) | | |
| | | Building wake effect | None | |
| | | Wind or release angle from North | 0 | deg |
| | | Handling of droplets | Not trapped | |
| | | Indoor mass modification factor | 3 | |
| Explosion parameters | Explosion method (Consequence calculations only) | Explosion method | TNT | |
| | Ignition | Supply late ignition location | No ignition location | |
| | | Location of late ignition | | m |
| | Vapour liquid method | Use of explosion mass modification factor | Early and late explosions | |
| | | Explosion mass modification factor | 3 | |
| TNT | TNT parameters | Air or ground burst | Air burst | |
| | | Default TNT explosion efficiency | 0,1 | fraction |
| Fireball | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 3 | |

| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 4; 12,5; 37,5 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Mass modification factor | 3 | |
| | | Fireball maximum exposure duration | 20 | s |
| | Calculation method | Fireball model | Recommended | |
| | | TNO model flame temperature | 1726,85 | degC |
| Jet fire | Jet fire method | Jet fire method | Cone model | |
| | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Rate modification factor | 3 | |
| | | Jet fire maximum exposure duration | 20 | s |
| | Cone model data | Crosswind angle | 0 | deg |
| | | Horizontal options | Use standard method | |
| | | Correlation | Recommended | |
| | Surface emissive power | Calculation method for surface emissive power | Calculate SEP | |
| | | Flame emissive power | | kW/m2 |
| | | Emissivity fraction | | fraction |
| Pool fire | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |

| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Radiative fraction for general fires | 0,4 | fraction |
| | | Pool fire maximum exposure duration | 20 | s |
| Geometry | Geometry | East | 0 | m |
| | | North | 0 | m |

## Leak

Leak

17129I_LNG_rev00\Top3_tubazione banchina_cricca\pipe_up

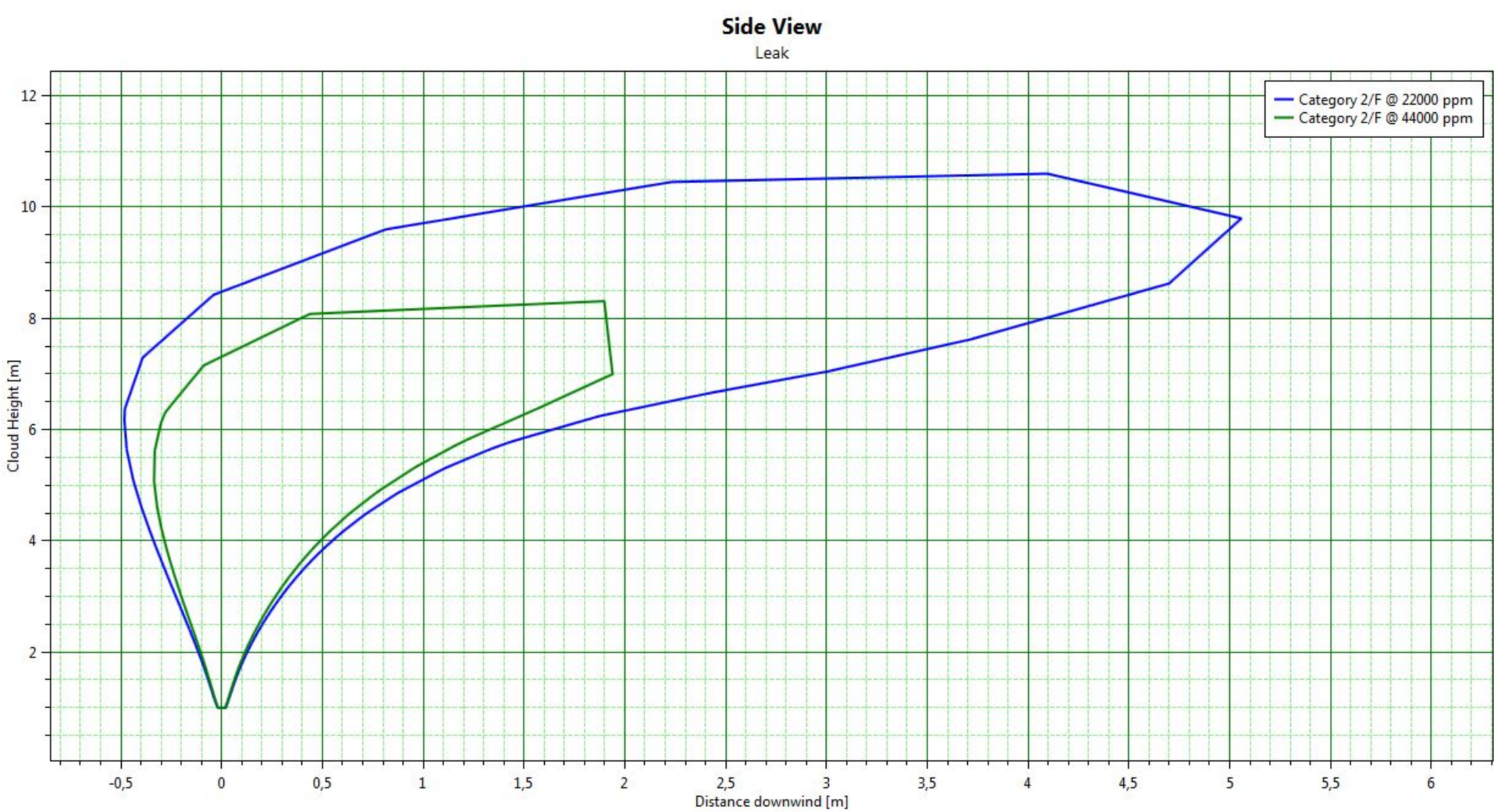
| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Scenario | Hole | Orifice diameter | 10 | mm |
| | | Use specified discharge coefficient? | No | |
| | | Discharge coefficient | | fraction |
| | Release location | Elevation | 1 | m |
| | | Tank head | 0 | m |
| | Direction | Outdoor release direction | Vertical | |
| | | Outdoor release angle | 90 | deg |
| Material | Material | Material characteristics | Flammable only | |
| | | Material to track | METHANE | |
| | Phase | Phase to be released | Liquid | |
| Discharge parameters | Model settings | Atmospheric expansion method | Closest to initial conditions | |
| | | Is flashing allowed to the orifice? | Allow flashing in the orifice | |
| | Droplet break-up mechanism | Droplet break-up mechanism - continuous | Use flashing correlation | |
| Dispersion | Dispersion scope | Concentration of interest | 22000 | ppm |
| | | Averaging time for concentration of interest | Flammable | |
| | | Specify user-defined averaging time | No | |

| | | | | |
|---|---|---|---|---|
| | | User defined averaging time | | s |
| | Distances of interest | Distances of interest | | m |
| | Averaging time for reports | ERPG [1 hr] | No | |
| | | IDLH [30 mins] | No | |
| | | STEL [15 mins] | No | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| Toxic parameters | Indoor toxic calculations | Specify the downwind building type | Unselected | |
| | | Building type (downwind building type) | Buildings\Building type | |
| | Exposure time data | Set averaging time equal to exposure time | Use a fixed averaging time | |
| | | Cut-off fraction of toxic load for exposure time calculation | 0,05 | fraction |
| | | Cut-off concentration for exposure time calculations | 0 | fraction |
| | Toxic contours | Number of toxic levels | 4 | |
| | | Dose levels | 130000; 1,3E+06; 1,3E+07; 1,3E+08 | |
| | | Probit levels | 2; 3; 4; 10 | |
| | | Lethality levels | 0,001; 0,01; 0,1; 0,99 | fraction |
| Explosion parameters | Explosion method (Consequence calculations only) | Explosion method | TNT | |
| | Ignition | Supply late ignition location | No ignition location | |
| | | Location of late ignition | | m |
| | Vapour liquid method | Use of explosion mass modification factor | Early and late explosions | |
| | | Explosion mass modification factor | 3 | |
| Fireball | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 3 | |
| | | Intensity levels | 4; 12,5; 37,5 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |

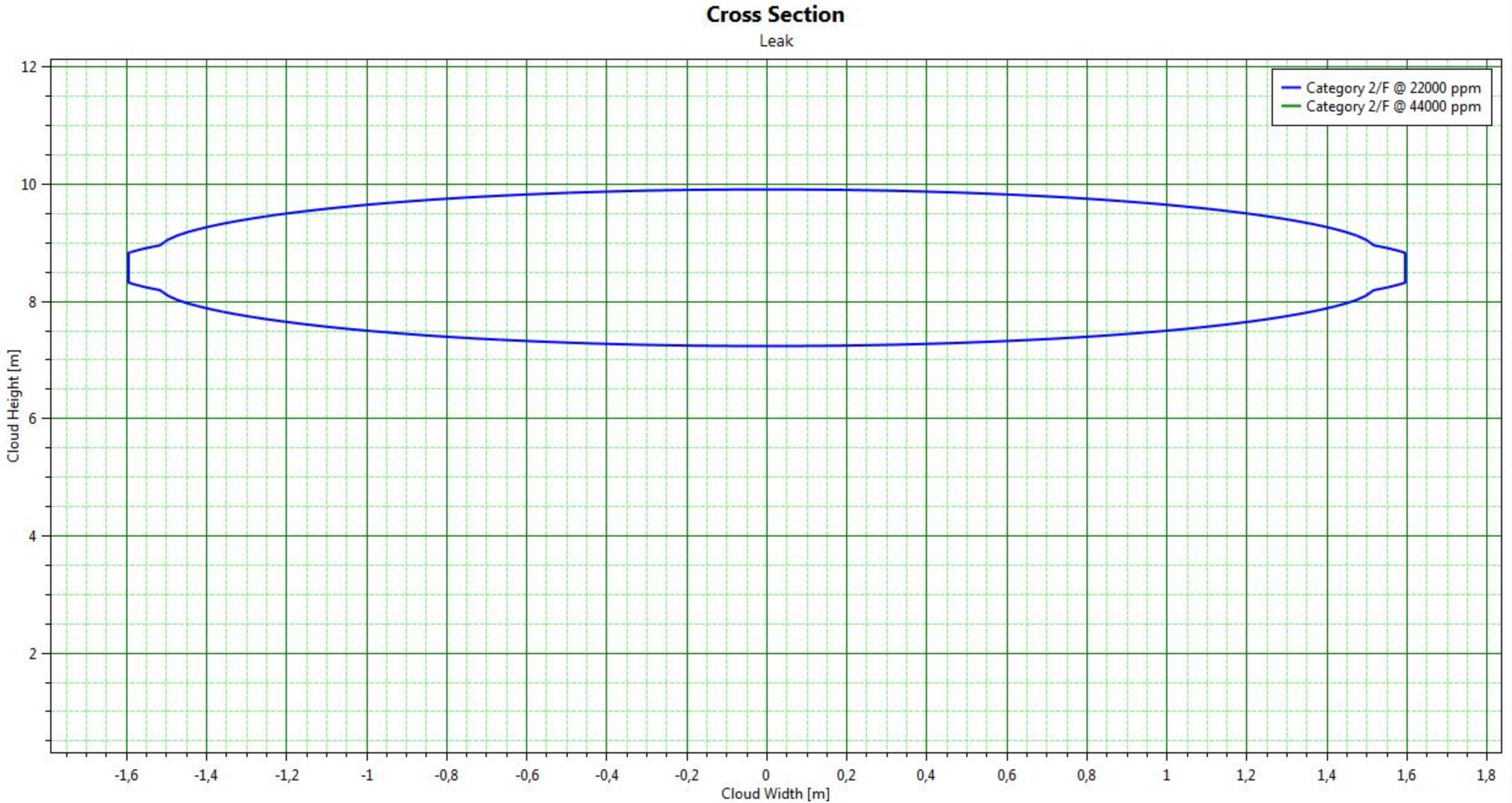
| | | | | |
|---|---|---|---|---|
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Mass modification factor | 3 | |
| | | Fireball maximum exposure duration | 20 | s |
| | Calculation method | Fireball model | Recommended | |
| | | TNO model flame temperature | 1726,85 | degC |
| Jet fire | Jet fire method | Jet fire method | Cone model | |
| | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Rate modification factor | 3 | |
| | | Jet fire maximum exposure duration | 20 | s |
| | Cone model data | Correlation | Recommended | |
| | | Horizontal options | Use standard method | |
| | Surface emissive power | Calculation method for surface emissive power | Calculate SEP | |
| | | Flame emissive power | | kW/m2 |
| | | Emissivity fraction | | fraction |
| Pool fire | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |

| | | | | |
|---|---|---|---|---|
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Radiative fraction for general fires | 0,4 | fraction |
| | | Pool fire maximum exposure duration | 20 | s |

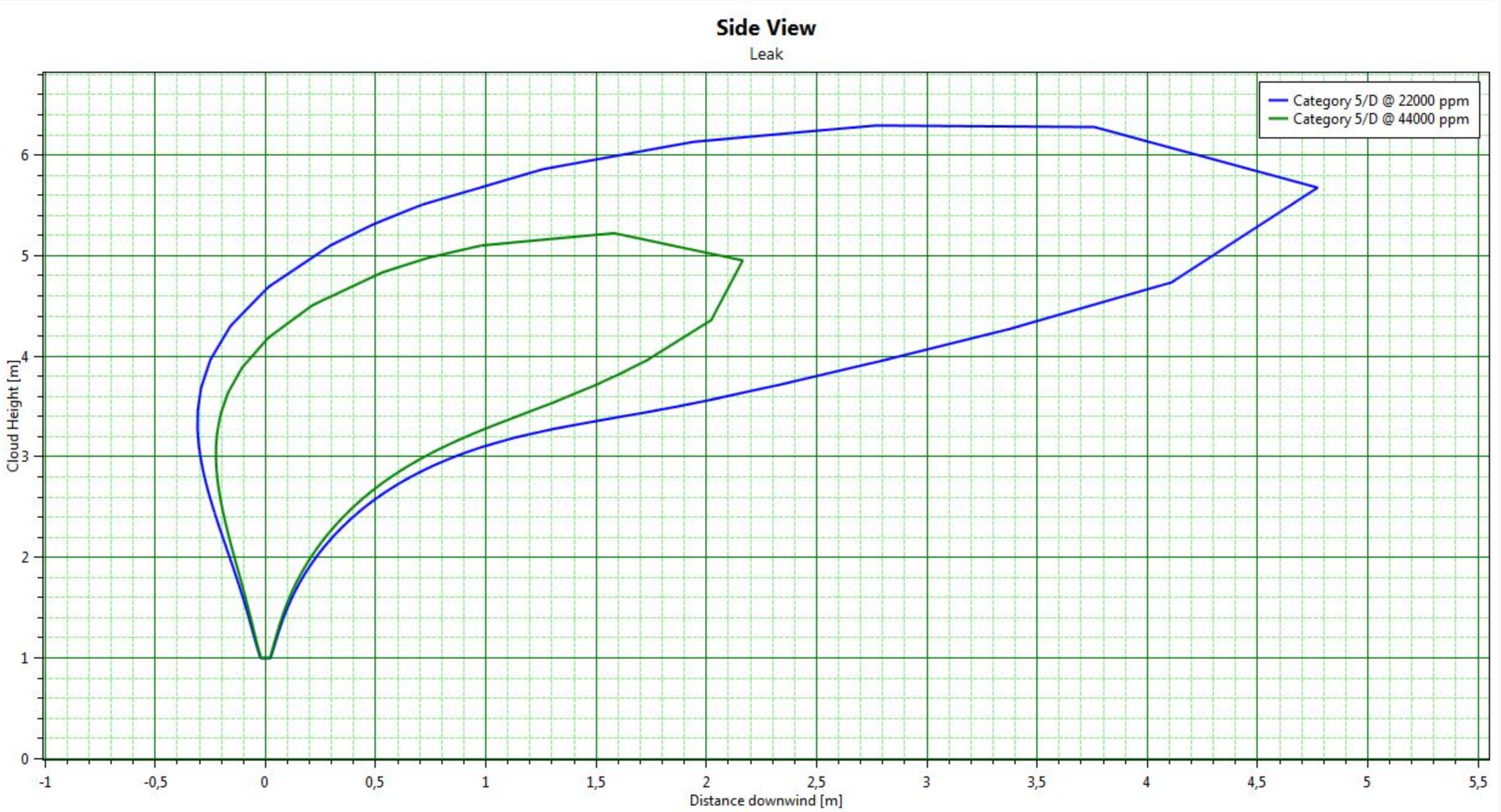
| | |
|---|---|
| Audit Number | 92413 |
| Averaging time | Flammable (18,75 s) |
| Equipment | pipe_up |
| Material | METHANE |
| Reference | METHANE |
| Offset Distance | 0 m |
| Program | Phast 7,21 |
| Scenario | Leak |
| Time | 6,54279 s |
| Weather | Category 2/F |
| Workspace | 17129I_LNG_rev00 |



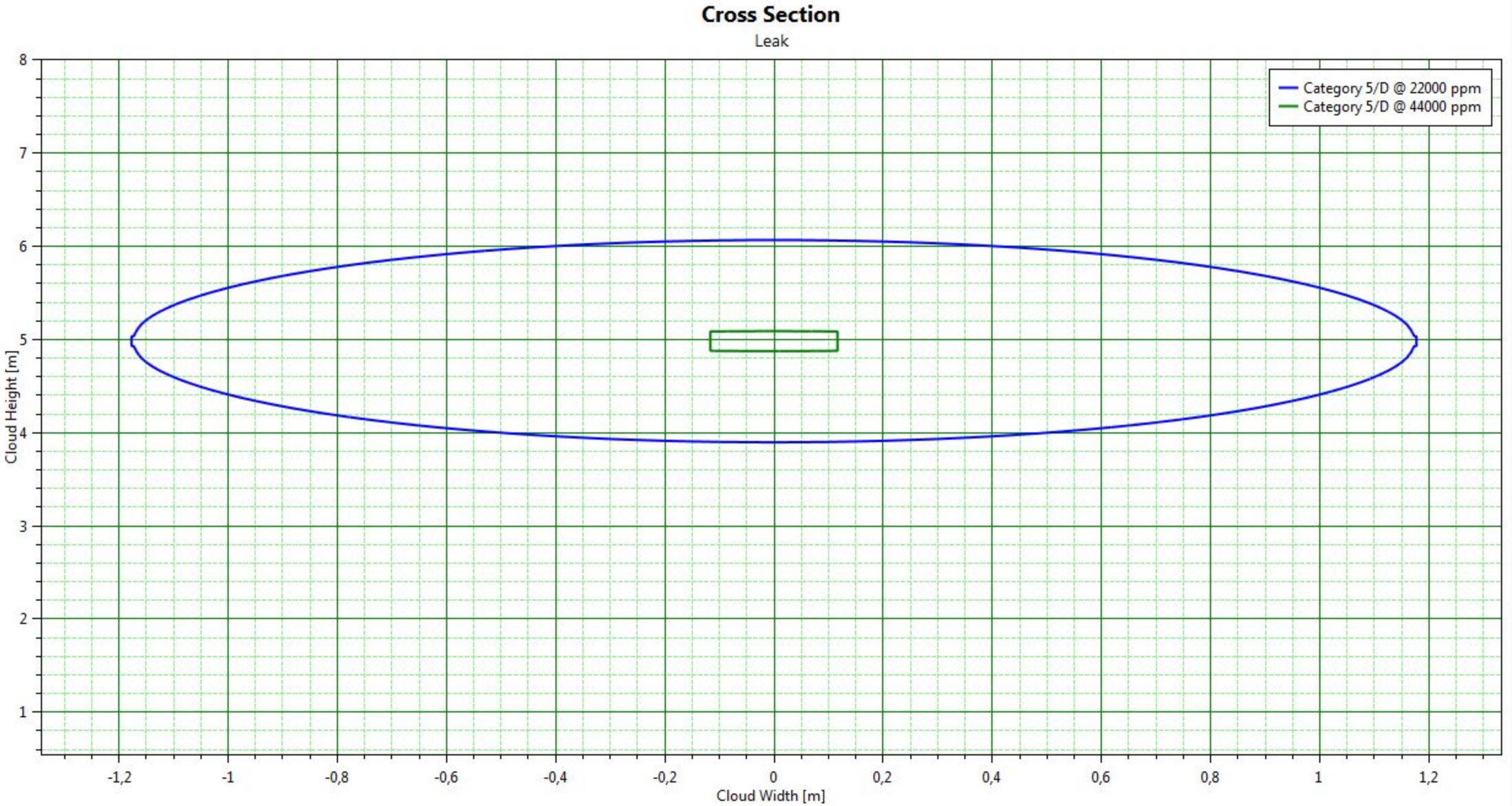
| | |
|---|---|
| Audit Number | 92413 |
| Averaging time | Flammable (18,75 s) |
| Downwind Distance | 2,2895 m |
| Equipment | pipe_up |
| Material | METHANE |
| Reference | METHANE |
| Program | Phast 7,21 |
| Scenario | Leak |
| Time | 6,54279 s |
| Weather | Category 2/F |
| Workspace | 17129I_LNG_rev00 |



| | |
|---|---|
| Audit Number | 92413 |
| Averaging time | Flammable (18,75 s) |
| Equipment | pipe_up |
| Material | METHANE |
| Reference | METHANE |
| Offset Distance | 0 m |
| Program | Phast 7,21 |
| Scenario | Leak |
| Time | 2,83021 s |
| Weather | Category 5/D |
| Workspace | 17129I_LNG_rev00 |



| | |
|---|---|
| Audit Number | 92413 |
| Averaging time | Flammable (18,75 s) |
| Downwind Distance | 2,2326 m |
| Equipment | pipe_up |
| Material | METHANE |
| Reference | METHANE |
| Program | Phast 7,21 |
| Scenario | Leak |
| Time | 2,83021 s |
| Weather | Category 5/D |
| Workspace | 17129I_LNG_rev00 |



# Input Report

## Workspace: 17129I_LNG_rev00

### Top4_tubazione banchina_cricca

Study

17129I_LNG_rev00

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Context of calculations | Selection of context | Weathers to use for this study | Weather folder | |
| | | Parameters to use for this study | Parameter set | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| Toxic parameters | Indoor toxic calculations | Specify the downwind building type | Unselected | |
| | | Building type (downwind building type) | Buildings\Building type | |
| Dispersion | Distances of interest | Distances of interest | | m |

### pipe_up

Pressure vessel

17129I_LNG_rev00\Top4_tubazione banchina_cricca

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Material | Material | Material | METHANE | |
| | | Specify volume inventory? | No | |
| | | Mass inventory | 167,169 | kg |
| | | Volume inventory | 0,412895 | m3 |
| | | Material to track | METHANE | |
| | Phase | Specified condition | Pressure/temperature | |
| | | Temperature | -150 | degC |
| | | Pressure (gauge) | 5 | bar |
| | | Fluid state | Liquid | |
| | | Liquid mole fraction | 1 | fraction |

| | | Phase to be released | Liquid | |
|---|---|---|---|---|
| Scenario | Pipe dimensions | Pipe length | | m |
| | Release location | Elevation | 1 | m |
| | | Tank head | 0 | m |
| | | Release height from vessel bottom | | m |
| | Direction | Outdoor release direction | Horizontal | |
| | | Outdoor release angle | 0 | deg |
| Discharge parameters | Model settings | Atmospheric expansion method | Isentropic | |
| | | Is flashing allowed to the orifice? | Allow flashing in the orifice | |
| | Droplet break-up mechanism | Droplet break-up mechanism - instantaneous | Use flashing correlation | |
| | | Droplet break-up mechanism - continuous | Use flashing correlation | |
| Short pipe | Pipe characteristics | Pipe roughness | 0,0457 | mm |
| | Frequencies | Frequency of bends in pipe | 0 | /m |
| | | Frequency of couplings in pipe | 0 | /m |
| | | Frequency of junctions in pipe | 0 | /m |
| | Frequencies of valves | Frequency of excess flow valves | 0 | /m |
| | | Frequency of non-return valves | 0 | /m |
| | | Frequency of shut-off valves | 0 | /m |
| | Velocity head losses | Excess flow valve velocity head losses | 0 | |
| | | Non-return valve velocity head losses | 0 | |
| | | Shut-off valve velocity head losses | 0 | |
| Time varying releases | Modelling of time-varying leaks and line ruptures | Vacuum relief valve | Operating | |
| | | Vacuum relief valve set point | 0 | bar |
| | Dimensions | Tank shape | | |
| | | Tank height | | m |
| | | Tank width | | m |
| | | Tank length | | m |
| | | Tank diameter | | m |
| | Inventory data | Tank volume | 0,412895 | m3 |
| | | Tank vapour volume | 0 | m3 |
| | | Tank liquid volume | 0,412895 | m3 |

| | | | | |
|---|---|---|---|---|
| | | Tank liquid level | 0 | m |
| | | Maximum vapour release height | | m |
| | | Maximum mass inventory | 1E+09 | kg |
| Dispersion | Dispersion scope | Concentration of interest | 19390 | ppm |
| | | Averaging time for concentration of interest | Flammable | |
| | | Specify user-defined averaging time | No | |
| | | User defined averaging time | | s |
| | Distances of interest | Distances of interest | | m |
| | Averaging time for reports | ERPG [1 hr] | No | |
| | | IDLH [30 mins] | No | |
| | | STEL [15 mins] | No | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| | Building definition | Specify a release building | No | |
| | | Specified building (release building) | | |
| | | Building wake effect | None | |
| | | Wind or release angle from North | 0 | deg |
| | | Handling of droplets | Not trapped | |
| | | Indoor mass modification factor | 3 | |
| Explosion parameters | Explosion method (Consequence calculations only) | Explosion method | TNT | |
| | Ignition | Supply late ignition location | No ignition location | |
| | | Location of late ignition | | m |
| | Vapour liquid method | Use of explosion mass modification factor | Early and late explosions | |
| | | Explosion mass modification factor | 3 | |
| TNT | TNT parameters | Air or ground burst | Air burst | |
| | | Default TNT explosion efficiency | 0,1 | fraction |
| Fireball | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 3 | |

| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 4; 12,5; 37,5 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Mass modification factor | 3 | |
| | | Fireball maximum exposure duration | 20 | s |
| | Calculation method | Fireball model | Recommended | |
| | | TNO model flame temperature | 1726,85 | degC |
| Jet fire | Jet fire method | Jet fire method | Cone model | |
| | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Rate modification factor | 3 | |
| | | Jet fire maximum exposure duration | 20 | s |
| | Cone model data | Crosswind angle | 0 | deg |
| | | Horizontal options | Use standard method | |
| | | Correlation | Recommended | |
| | Surface emissive power | Calculation method for surface emissive power | Calculate SEP | |
| | | Flame emissive power | | kW/m2 |
| | | Emissivity fraction | | fraction |
| Pool fire | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |

| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Radiative fraction for general fires | 0,4 | fraction |
| | | Pool fire maximum exposure duration | 20 | s |
| Geometry | Geometry | East | 0 | m |
| | | North | 0 | m |

## Leak

Leak

17129I_LNG_rev00\Top4_tubazione banchina_cricca\pipe_up

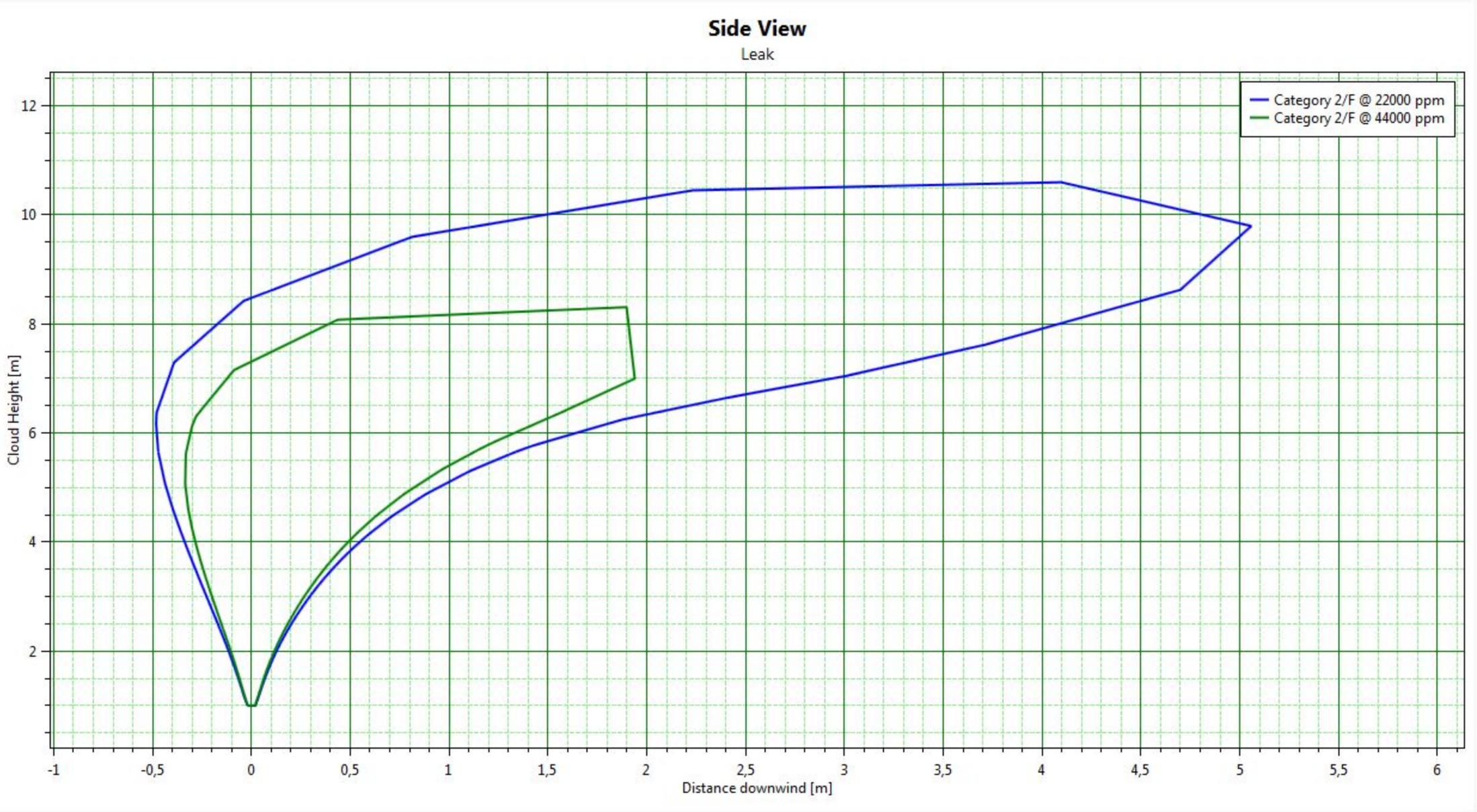
| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Scenario | Hole | Orifice diameter | 10 | mm |
| | | Use specified discharge coefficient? | No | |
| | | Discharge coefficient | | fraction |
| | Release location | Elevation | 1 | m |
| | | Tank head | 0 | m |
| | Direction | Outdoor release direction | Vertical | |
| | | Outdoor release angle | 90 | deg |
| Material | Material | Material characteristics | Flammable only | |
| | | Material to track | METHANE | |
| | Phase | Phase to be released | Liquid | |
| Discharge parameters | Model settings | Atmospheric expansion method | Closest to initial conditions | |
| | | Is flashing allowed to the orifice? | Allow flashing in the orifice | |
| | Droplet break-up mechanism | Droplet break-up mechanism - continuous | Use flashing correlation | |
| Dispersion | Dispersion scope | Concentration of interest | 22000 | ppm |
| | | Averaging time for concentration of interest | Flammable | |
| | | Specify user-defined averaging time | No | |

| | | | | |
|---|---|---|---|---|
| | | User defined averaging time | | s |
| | Distances of interest | Distances of interest | | m |
| | Averaging time for reports | ERPG [1 hr] | No | |
| | | IDLH [30 mins] | No | |
| | | STEL [15 mins] | No | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| Toxic parameters | Indoor toxic calculations | Specify the downwind building type | Unselected | |
| | | Building type (downwind building type) | Buildings\Building type | |
| | Exposure time data | Set averaging time equal to exposure time | Use a fixed averaging time | |
| | | Cut-off fraction of toxic load for exposure time calculation | 0,05 | fraction |
| | | Cut-off concentration for exposure time calculations | 0 | fraction |
| | Toxic contours | Number of toxic levels | 4 | |
| | | Dose levels | 130000; 1,3E+06; 1,3E+07; 1,3E+08 | |
| | | Probit levels | 2; 3; 4; 10 | |
| | | Lethality levels | 0,001; 0,01; 0,1; 0,99 | fraction |
| Explosion parameters | Explosion method (Consequence calculations only) | Explosion method | TNT | |
| | Ignition | Supply late ignition location | No ignition location | |
| | | Location of late ignition | | m |
| | Vapour liquid method | Use of explosion mass modification factor | Early and late explosions | |
| | | Explosion mass modification factor | 3 | |
| Fireball | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 3 | |
| | | Intensity levels | 4; 12,5; 37,5 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |

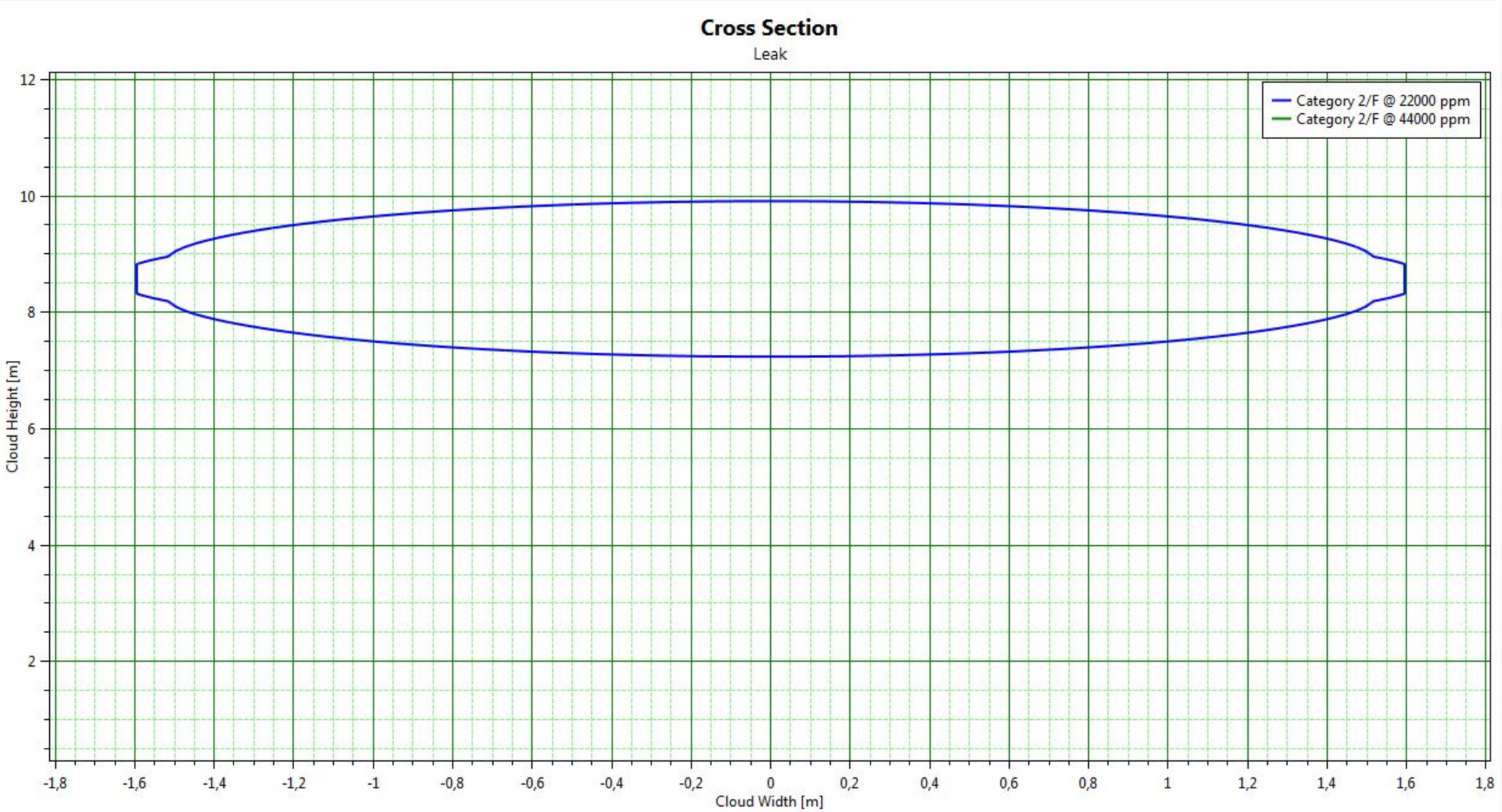
| | | | | |
|---|---|---|---|---|
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Mass modification factor | 3 | |
| | | Fireball maximum exposure duration | 20 | s |
| | Calculation method | Fireball model | Recommended | |
| | | TNO model flame temperature | 1726,85 | degC |
| Jet fire | Jet fire method | Jet fire method | Cone model | |
| | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Rate modification factor | 3 | |
| | | Jet fire maximum exposure duration | 20 | s |
| | Cone model data | Correlation | Recommended | |
| | | Horizontal options | Use standard method | |
| | Surface emissive power | Calculation method for surface emissive power | Calculate SEP | |
| | | Flame emissive power | | kW/m2 |
| | | Emissivity fraction | | fraction |
| Pool fire | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |

| | | | | |
|---|---|---|---|---|
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Radiative fraction for general fires | 0,4 | fraction |
| | | Pool fire maximum exposure duration | 20 | s |

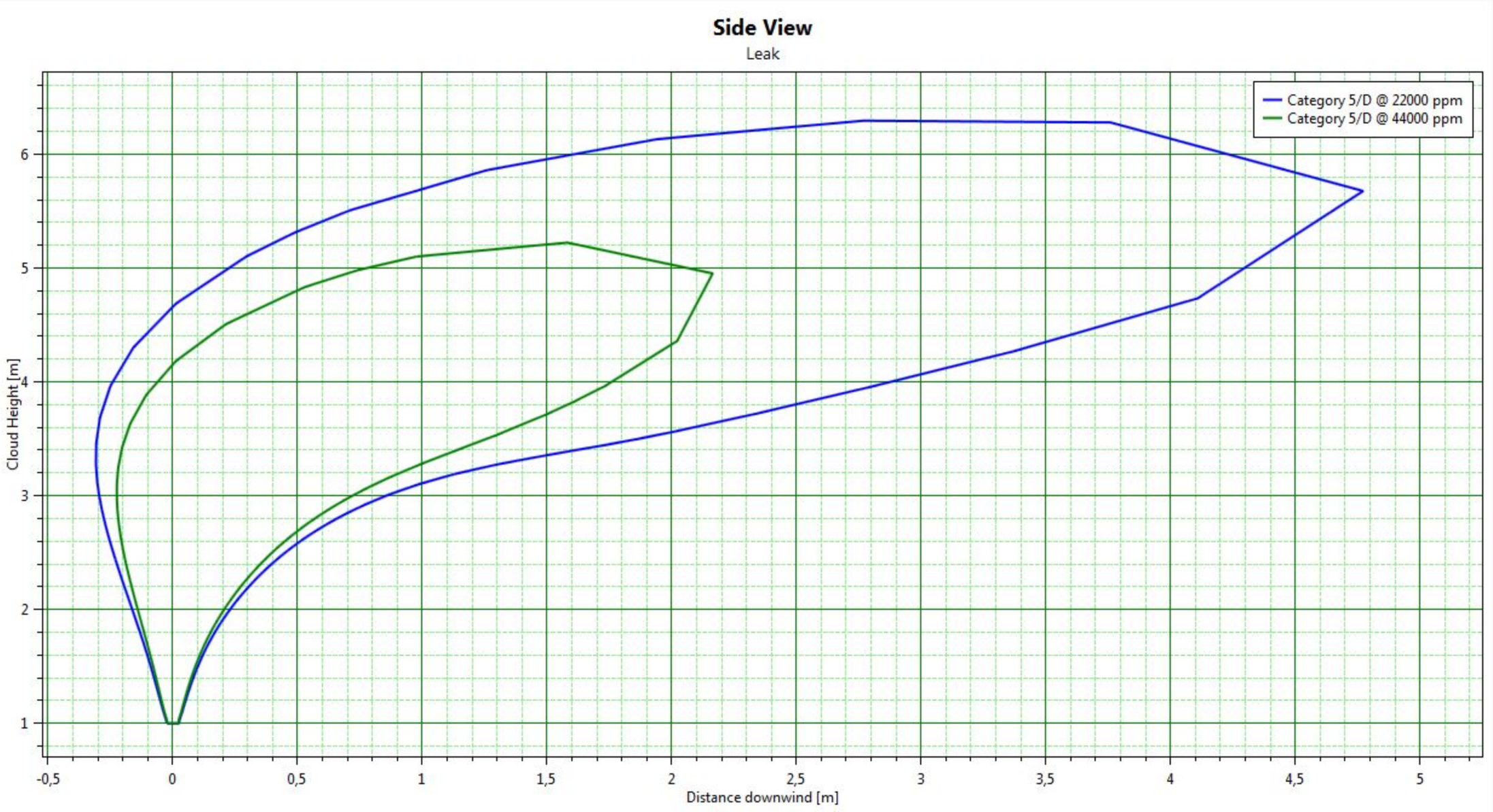
| | |
|---|---|
| Audit Number | 92414 |
| Averaging time | Flammable (18,75 s) |
| Equipment | pipe_up |
| Material | METHANE |
| Reference | METHANE |
| Offset Distance | 0 m |
| Program | Phast 7,21 |
| Scenario | Leak |
| Time | 4,69519 s |
| Weather | Category 2/F |
| Workspace | 17129I_LNG_rev00 |



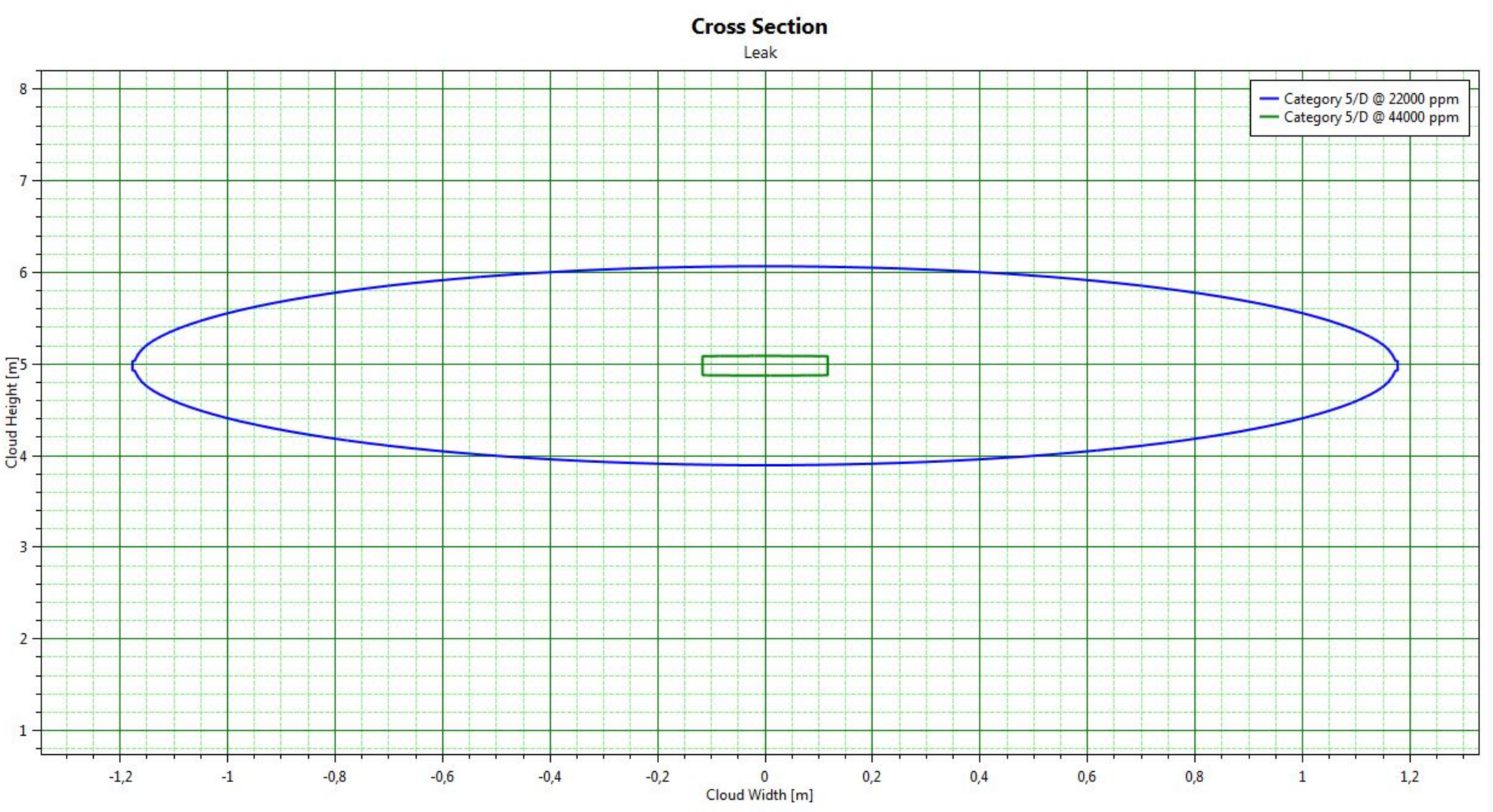
| | |
|---|---|
| Audit Number | 92414 |
| Averaging time | Flammable (18,75 s) |
| Downwind Distance | 2,2895 m |
| Equipment | pipe_up |
| Material | METHANE |
| Reference | METHANE |
| Program | Phast 7,21 |
| Scenario | Leak |
| Time | 4,69519 s |
| Weather | Category 2/F |
| Workspace | 17129I_LNG_rev00 |



| | |
|---|---|
| Audit Number | 92414 |
| Averaging time | Flammable (18,75 s) |
| Equipment | pipe_up |
| Material | METHANE |
| Reference | METHANE |
| Offset Distance | 0 m |
| Program | Phast 7,21 |
| Scenario | Leak |
| Time | 2,83021 s |
| Weather | Category 5/D |
| Workspace | 17129I_LNG_rev00 |



| | |
|---|---|
| Audit Number | 92414 |
| Averaging time | Flammable (18,75 s) |
| Downwind Distance | 2,2326 m |
| Equipment | pipe_up |
| Material | METHANE |
| Reference | METHANE |
| Program | Phast 7,21 |
| Scenario | Leak |
| Time | 2,83021 s |
| Weather | Category 5/D |
| Workspace | 17129I_LNG_rev00 |



# Input Report

## Workspace: 17129I_LNG_rev00

### Top5_Rilascio serbatoio_5mm

Study

17129I_LNG_rev00

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Context of calculations | Selection of context | Weathers to use for this study | Weather folder | |
| | | Parameters to use for this study | Parameter set | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| Toxic parameters | Indoor toxic calculations | Specify the downwind building type | Unselected | |
| | | Building type (downwind building type) | Buildings\Building type | |
| Dispersion | Distances of interest | Distances of interest | | m |

### pipe

Pressure vessel

17129I_LNG_rev00\Top5_Rilascio serbatoio_5mm

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Material | Material | Material | METHANE | |
| | | Specify volume inventory? | No | |
| | | Mass inventory | 41,4 | kg |
| | | Volume inventory | 0,102255 | m3 |
| | | Material to track | METHANE | |
| | Phase | Specified condition | Pressure/temperature | |
| | | Temperature | -150 | degC |
| | | Pressure (gauge) | 5 | bar |
| | | Fluid state | Liquid | |
| | | Liquid mole fraction | 1 | fraction |

| | | Phase to be released | Liquid | |
|---|---|---|---|---|
| Scenario | Pipe dimensions | Pipe length | | m |
| | Release location | Elevation | 1 | m |
| | | Tank head | 0 | m |
| | | Release height from vessel bottom | | m |
| | Direction | Outdoor release direction | Horizontal | |
| | | Outdoor release angle | 0 | deg |
| Discharge parameters | Model settings | Atmospheric expansion method | Isentropic | |
| | | Is flashing allowed to the orifice? | Allow flashing in the orifice | |
| | Droplet break-up mechanism | Droplet break-up mechanism - instantaneous | Use flashing correlation | |
| | | Droplet break-up mechanism - continuous | Use flashing correlation | |
| Short pipe | Pipe characteristics | Pipe roughness | 0,0457 | mm |
| | Frequencies | Frequency of bends in pipe | 0 | /m |
| | | Frequency of couplings in pipe | 0 | /m |
| | | Frequency of junctions in pipe | 0 | /m |
| | Frequencies of valves | Frequency of excess flow valves | 0 | /m |
| | | Frequency of non-return valves | 0 | /m |
| | | Frequency of shut-off valves | 0 | /m |
| | Velocity head losses | Excess flow valve velocity head losses | 0 | |
| | | Non-return valve velocity head losses | 0 | |
| | | Shut-off valve velocity head losses | 0 | |
| Time varying releases | Modelling of time-varying leaks and line ruptures | Vacuum relief valve | Operating | |
| | | Vacuum relief valve set point | 0 | bar |
| | Dimensions | Tank shape | | |
| | | Tank height | | m |
| | | Tank width | | m |
| | | Tank length | | m |
| | | Tank diameter | | m |
| | Inventory data | Tank volume | 0,102255 | m3 |
| | | Tank vapour volume | 0 | m3 |
| | | Tank liquid volume | 0,102255 | m3 |

| | | | | |
|---|---|---|---|---|
| | | Tank liquid level | 0 | m |
| | | Maximum vapour release height | | m |
| | | Maximum mass inventory | 1E+09 | kg |
| Dispersion | Dispersion scope | Concentration of interest | 19390 | ppm |
| | | Averaging time for concentration of interest | Flammable | |
| | | Specify user-defined averaging time | No | |
| | | User defined averaging time | | s |
| | Distances of interest | Distances of interest | | m |
| | Averaging time for reports | ERPG [1 hr] | No | |
| | | IDLH [30 mins] | No | |
| | | STEL [15 mins] | No | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| | Building definition | Specify a release building | No | |
| | | Specified building (release building) | | |
| | | Building wake effect | None | |
| | | Wind or release angle from North | 0 | deg |
| | | Handling of droplets | Not trapped | |
| | | Indoor mass modification factor | 3 | |
| Explosion parameters | Explosion method (Consequence calculations only) | Explosion method | TNT | |
| | Ignition | Supply late ignition location | No ignition location | |
| | | Location of late ignition | | m |
| | Vapour liquid method | Use of explosion mass modification factor | Early and late explosions | |
| | | Explosion mass modification factor | 3 | |
| TNT | TNT parameters | Air or ground burst | Air burst | |
| | | Default TNT explosion efficiency | 0,1 | fraction |
| Fireball | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 3 | |

| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 4; 12,5; 37,5 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Mass modification factor | 3 | |
| | | Fireball maximum exposure duration | 20 | s |
| | Calculation method | Fireball model | Recommended | |
| | | TNO model flame temperature | 1726,85 | degC |
| Jet fire | Jet fire method | Jet fire method | Cone model | |
| | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Rate modification factor | 3 | |
| | | Jet fire maximum exposure duration | 20 | s |
| | Cone model data | Crosswind angle | 0 | deg |
| | | Horizontal options | Use standard method | |
| | | Correlation | Recommended | |
| | Surface emissive power | Calculation method for surface emissive power | Calculate SEP | |
| | | Flame emissive power | | kW/m2 |
| | | Emissivity fraction | | fraction |
| Pool fire | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |

| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Radiative fraction for general fires | 0,4 | fraction |
| | | Pool fire maximum exposure duration | 20 | s |
| Geometry | Geometry | East | 0 | m |
| | | North | 0 | m |

## Leak

Leak

17129I_LNG_rev00\Top5_Rilascio serbatoio_5mm\pipe

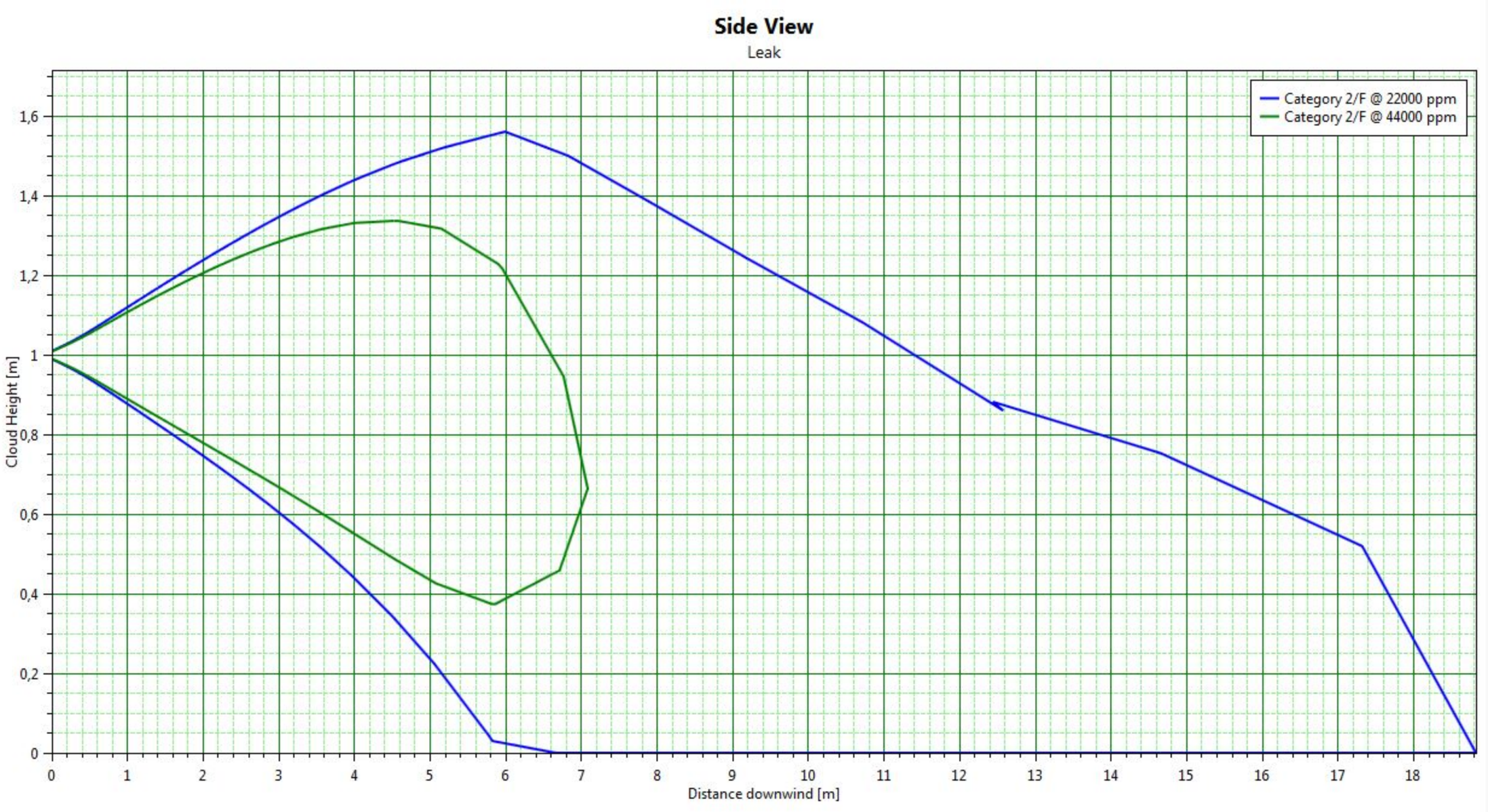
| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Scenario | Hole | Orifice diameter | 5 | mm |
| | | Use specified discharge coefficient? | No | |
| | | Discharge coefficient | | fraction |
| | Release location | Elevation | 1 | m |
| | | Tank head | 0 | m |
| | Direction | Outdoor release direction | Horizontal | |
| | | Outdoor release angle | 0 | deg |
| Material | Material | Material characteristics | Flammable only | |
| | | Material to track | METHANE | |
| | Phase | Phase to be released | Liquid | |
| Discharge parameters | Model settings | Atmospheric expansion method | Closest to initial conditions | |
| | | Is flashing allowed to the orifice? | Allow flashing in the orifice | |
| | Droplet break-up mechanism | Droplet break-up mechanism - continuous | Use flashing correlation | |
| Dispersion | Dispersion scope | Concentration of interest | 22000 | ppm |
| | | Averaging time for concentration of interest | Flammable | |
| | | Specify user-defined averaging time | No | |

| | | | | |
|---|---|---|---|---|
| | | User defined averaging time | | s |
| | Distances of interest | Distances of interest | | m |
| | Averaging time for reports | ERPG [1 hr] | No | |
| | | IDLH [30 mins] | No | |
| | | STEL [15 mins] | No | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| Toxic parameters | Indoor toxic calculations | Specify the downwind building type | Unselected | |
| | | Building type (downwind building type) | Buildings\Building type | |
| | Exposure time data | Set averaging time equal to exposure time | Use a fixed averaging time | |
| | | Cut-off fraction of toxic load for exposure time calculation | 0,05 | fraction |
| | | Cut-off concentration for exposure time calculations | 0 | fraction |
| | Toxic contours | Number of toxic levels | 4 | |
| | | Dose levels | 130000; 1,3E+06; 1,3E+07; 1,3E+08 | |
| | | Probit levels | 2; 3; 4; 10 | |
| | | Lethality levels | 0,001; 0,01; 0,1; 0,99 | fraction |
| Explosion parameters | Explosion method (Consequence calculations only) | Explosion method | TNT | |
| | Ignition | Supply late ignition location | No ignition location | |
| | | Location of late ignition | | m |
| | Vapour liquid method | Use of explosion mass modification factor | Early and late explosions | |
| | | Explosion mass modification factor | 3 | |
| TNT | TNT parameters | Air or ground burst | Air burst | |
| | | Default TNT explosion efficiency | 0,1 | fraction |
| Fireball | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 3 | |

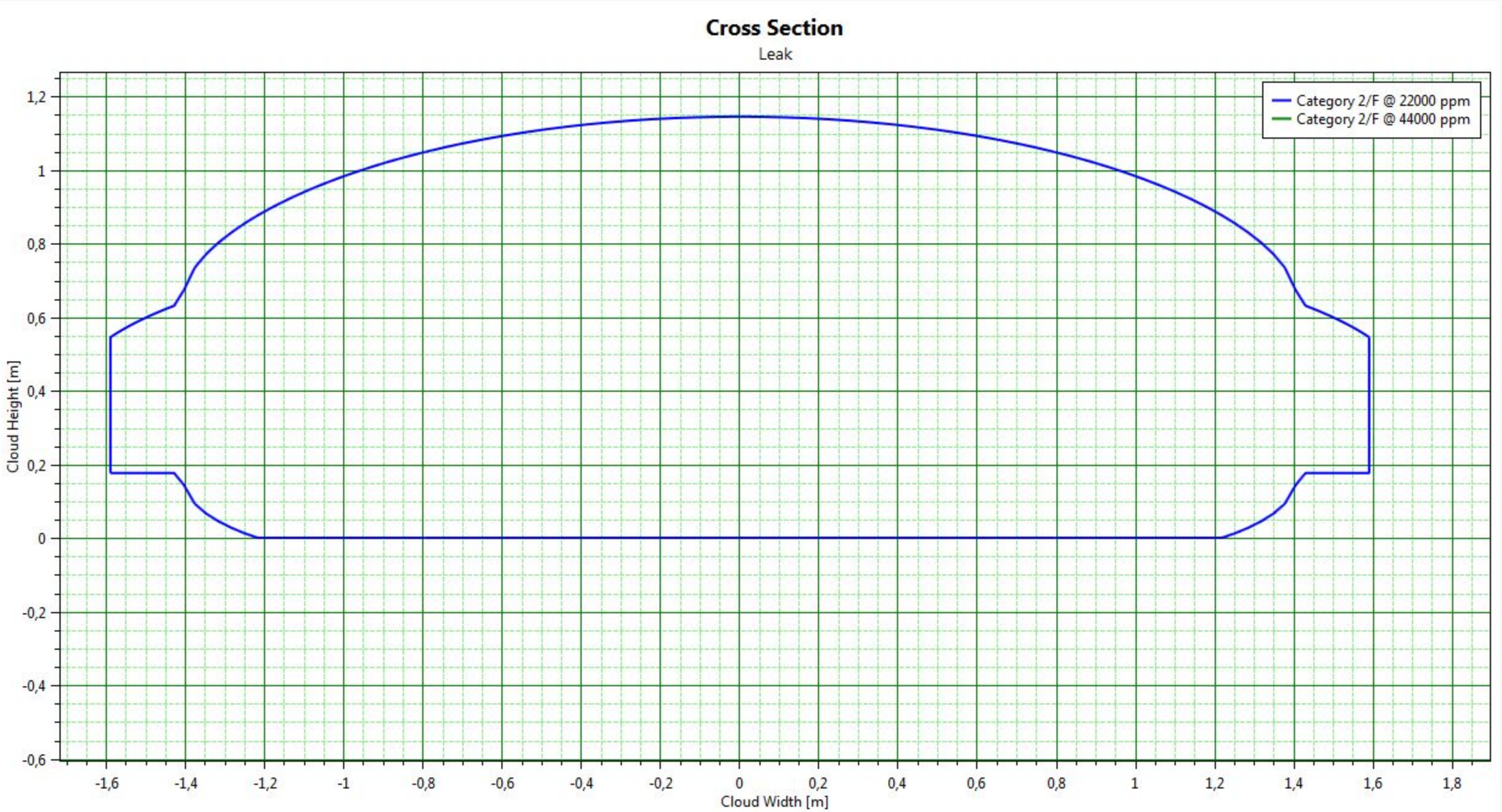
| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 4; 12,5; 37,5 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Mass modification factor | 3 | |
| | | Fireball maximum exposure duration | 20 | s |
| | Calculation method | Fireball model | Recommended | |
| | | TNO model flame temperature | 1726,85 | degC |
| Jet fire | Jet fire method | Jet fire method | Cone model | |
| | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Rate modification factor | 3 | |
| | | Jet fire maximum exposure duration | 20 | s |
| | Cone model data | Correlation | Recommended | |
| | | Horizontal options | Use standard method | |
| | Surface emissive power | Calculation method for surface emissive power | Calculate SEP | |
| | | Flame emissive power | | kW/m2 |
| | | Emissivity fraction | | fraction |
| Pool fire | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |

| | | | | |
|---|---|---|---|---|
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Radiative fraction for general fires | 0,4 | fraction |
| | | Pool fire maximum exposure duration | 20 | s |

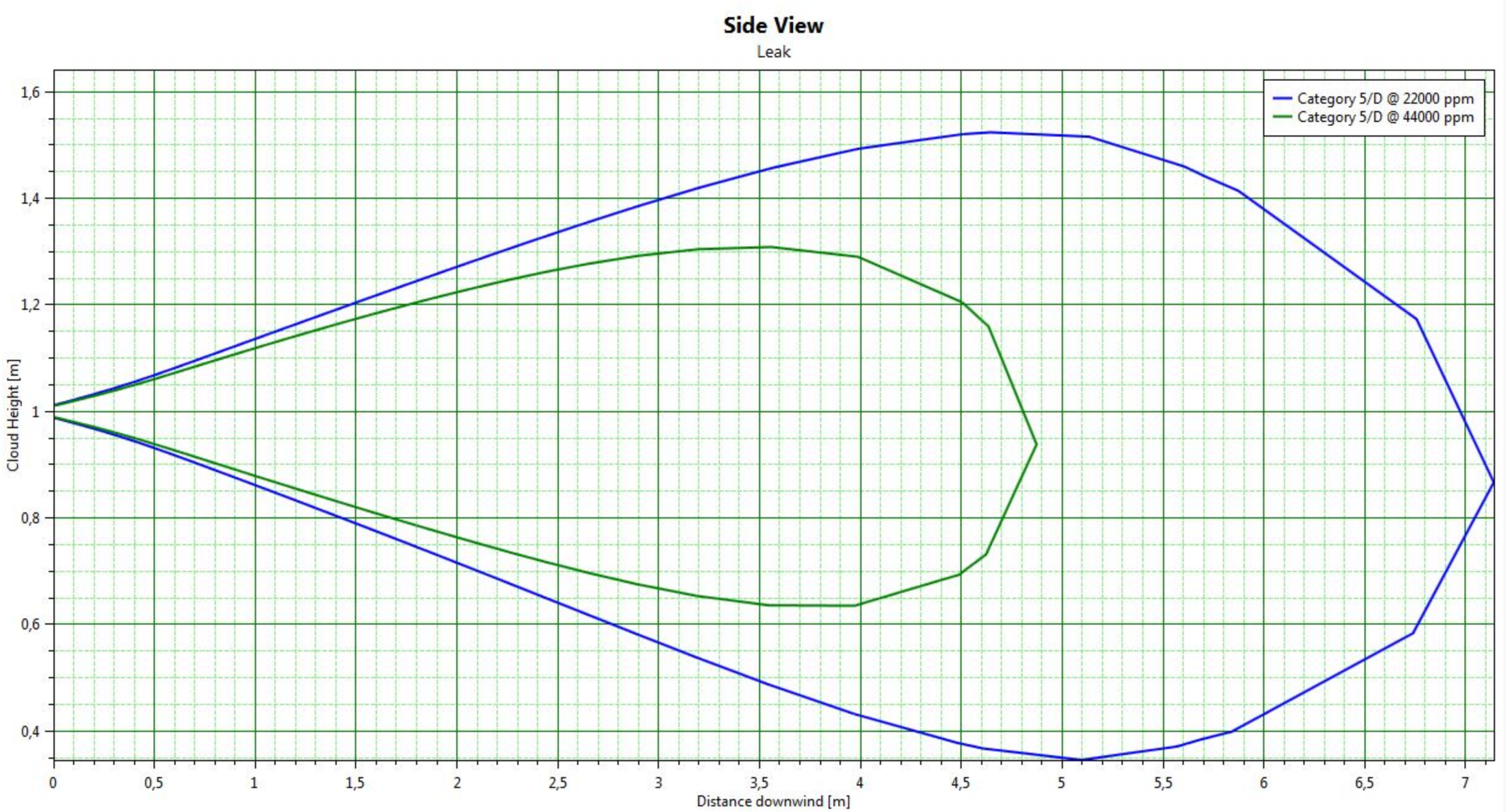
| | |
|---|---|
| Audit Number | 92415 |
| Averaging time | Flammable (18,75 s) |
| Equipment | pipe |
| Material | METHANE |
| Reference | METHANE |
| Offset Distance | 0 m |
| Program | Phast 7,21 |
| Scenario | Leak |
| Time | 12,5046 s |
| Weather | Category 2/F |
| Workspace | 17129I_LNG_rev00 |



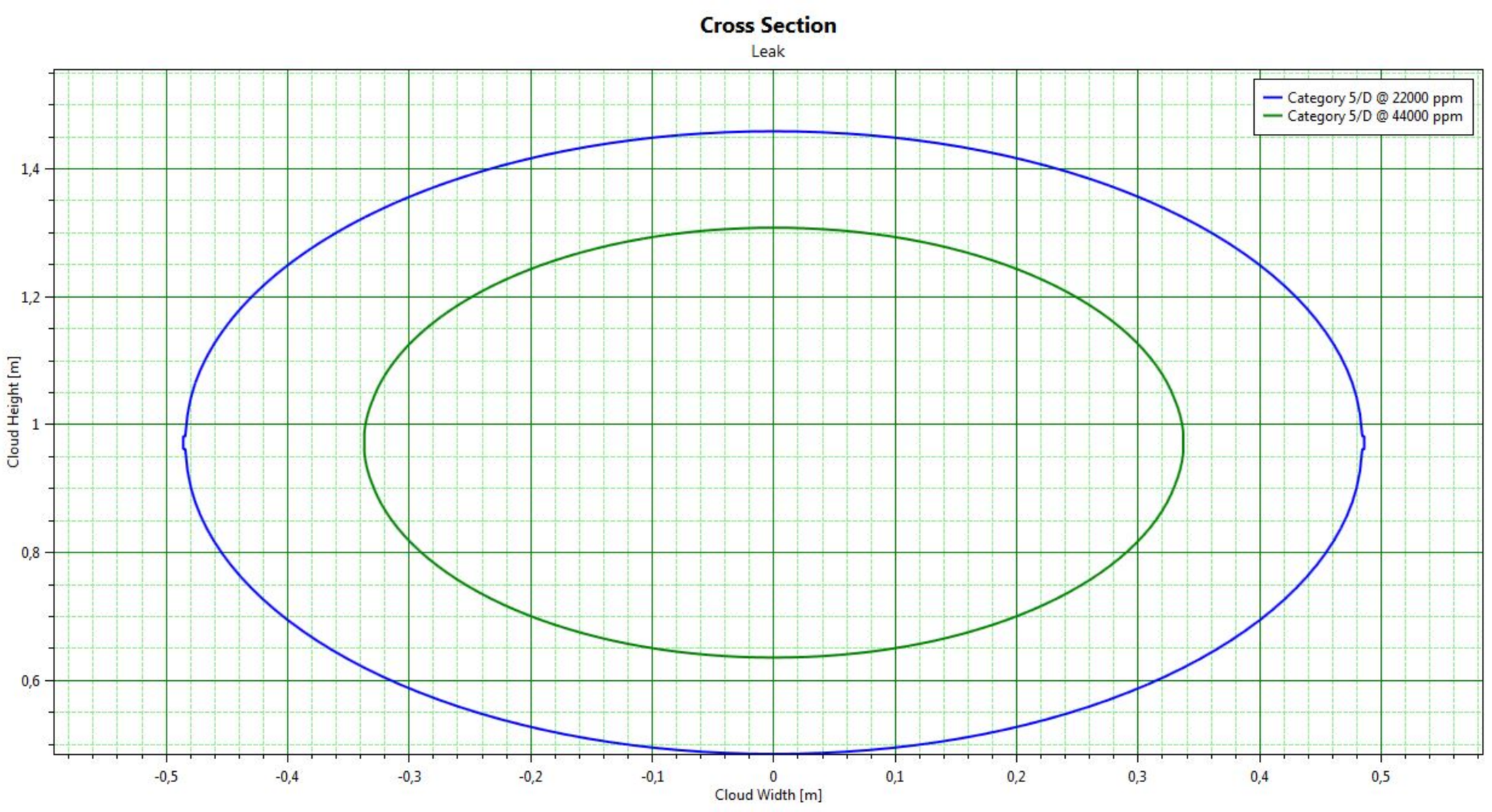
| | |
|---|---|
| Audit Number | 92415 |
| Averaging time | Flammable (18,75 s) |
| Downwind Distance | 10 m |
| Equipment | pipe |
| Material | METHANE |
| Reference | METHANE |
| Program | Phast 7,21 |
| Scenario | Leak |
| Time | 12,5046 s |
| Weather | Category 2/F |
| Workspace | 17129I_LNG_rev00 |



| | |
|---|---|
| Audit Number | 92415 |
| Averaging time | Flammable (18,75 s) |
| Equipment | pipe |
| Material | METHANE |
| Reference | METHANE |
| Offset Distance | 0 m |
| Program | Phast 7,21 |
| Scenario | Leak |
| Time | 2,81175 s |
| Weather | Category 5/D |
| Workspace | 17129I_LNG_rev00 |



| | |
|---|---|
| Audit Number | 92415 |
| Averaging time | Flammable (18,75 s) |
| Downwind Distance | 3,56982 m |
| Equipment | pipe |
| Material | METHANE |
| Reference | METHANE |
| Program | Phast 7,21 |
| Scenario | Leak |
| Time | 2,81175 s |
| Weather | Category 5/D |
| Workspace | 17129I_LNG_rev00 |



# Input Report

## Workspace: 17129I_LNG_istr_rev01_04

### Top7_Pipe mandata vaporizzatori

Study

17129I_LNG_istr_rev01_04

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Context of calculations | Selection of context | Weathers to use for this study | Weather folder | |
| | | Parameters to use for this study | Parameter set | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| Toxic parameters | Indoor toxic calculations | Specify the downwind building type | Unselected | |
| | | Building type (downwind building type) | Buildings\Building type | |
| Dispersion | Distances of interest | Distances of interest | | m |

### pipe_70bar

Pressure vessel

17129I_LNG_istr_rev01_04\Top7_Pipe mandata vaporizzatori

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Material | Material | Material | METHANE | |
| | | Specify volume inventory? | No | |
| | | Mass inventory | 4000 | kg |
| | | Volume inventory | 9,87972 | m3 |
| | | Material to track | METHANE | |
| | Phase | Specified condition | Pressure/temperature | |
| | | Temperature | -150 | degC |
| | | Pressure (gauge) | 70 | bar |
| | | Fluid state | Liquid | |
| | | Liquid mole fraction | 1 | fraction |

| | | | | |
|---|---|---|---|---|
| | | Phase to be released | Liquid | |
| Scenario | Pipe dimensions | Pipe length | | m |
| | Release location | Elevation | 6 | m |
| | | Tank head | 0 | m |
| | | Release height from vessel bottom | | m |
| | Direction | Outdoor release direction | Horizontal | |
| | | Outdoor release angle | 0 | deg |
| Discharge parameters | Model settings | Atmospheric expansion method | Closest to initial conditions | |
| | | Is flashing allowed to the orifice? | Allow flashing in the orifice | |
| | Droplet break-up mechanism | Droplet break-up mechanism - instantaneous | Use flashing correlation | |
| | | Droplet break-up mechanism - continuous | Use flashing correlation | |
| Short pipe | Pipe characteristics | Pipe roughness | 0,0457 | mm |
| | Frequencies | Frequency of bends in pipe | 0 | /m |
| | | Frequency of couplings in pipe | 0 | /m |
| | | Frequency of junctions in pipe | 0 | /m |
| | Frequencies of valves | Frequency of excess flow valves | 0 | /m |
| | | Frequency of non-return valves | 0 | /m |
| | | Frequency of shut-off valves | 0 | /m |
| | Velocity head losses | Excess flow valve velocity head losses | 0 | |
| | | Non-return valve velocity head losses | 0 | |
| | | Shut-off valve velocity head losses | 0 | |
| Time varying releases | Modelling of time-varying leaks and line ruptures | Vacuum relief valve | Operating | |
| | | Vacuum relief valve set point | 0 | bar |
| | Dimensions | Tank shape | | |
| | | Tank height | | m |
| | | Tank width | | m |
| | | Tank length | | m |
| | | Tank diameter | | m |
| | Inventory data | Tank volume | 9,87972 | m3 |
| | | Tank vapour volume | 0 | m3 |
| | | Tank liquid volume | 9,87972 | m3 |

| | | | | |
|---|---|---|---|---|
| | | Tank liquid level | 0 | m |
| | | Maximum vapour release height | | m |
| | | Maximum mass inventory | 1E+09 | kg |
| Dispersion | Dispersion scope | Concentration of interest | 19390 | ppm |
| | | Averaging time for concentration of interest | Flammable | |
| | | Specify user-defined averaging time | No | |
| | | User defined averaging time | | s |
| | Distances of interest | Distances of interest | | m |
| | Averaging time for reports | ERPG [1 hr] | No | |
| | | IDLH [30 mins] | No | |
| | | STEL [15 mins] | No | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| | Building definition | Specify a release building | No | |
| | | Specified building (release building) | | |
| | | Building wake effect | None | |
| | | Wind or release angle from North | 0 | deg |
| | | Handling of droplets | Not trapped | |
| | | Indoor mass modification factor | 3 | |
| Explosion parameters | Explosion method (Consequence calculations only) | Explosion method | TNT | |
| | Ignition | Supply late ignition location | No ignition location | |
| | | Location of late ignition | | m |
| | Vapour liquid method | Use of explosion mass modification factor | Early and late explosions | |
| | | Explosion mass modification factor | 3 | |
| TNT | TNT parameters | Air or ground burst | Air burst | |
| | | Default TNT explosion efficiency | 0,1 | fraction |
| Fireball | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 3 | |

| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 4; 12,5; 37,5 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Mass modification factor | 3 | |
| | | Fireball maximum exposure duration | 20 | s |
| | Calculation method | Fireball model | Recommended | |
| | | TNO model flame temperature | 1726,85 | degC |
| Jet fire | Jet fire method | Jet fire method | Cone model | |
| | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Rate modification factor | 3 | |
| | | Jet fire maximum exposure duration | 20 | s |
| | Cone model data | Crosswind angle | 0 | deg |
| | | Horizontal options | Use standard method | |
| | | Correlation | Recommended | |
| | Surface emissive power | Calculation method for surface emissive power | Calculate SEP | |
| | | Flame emissive power | | kW/m2 |
| | | Emissivity fraction | | fraction |
| Pool fire | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |

| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Radiative fraction for general fires | 0,4 | fraction |
| | | Pool fire maximum exposure duration | 20 | s |
| Geometry | Geometry | East | 0 | m |
| | | North | 0 | m |

## Leak_10mm

Leak

17129I_LNG_istr_rev01_04\Top7_Pipe mandata vaporizzatori\pipe_70bar

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Scenario | Hole | Orifice diameter | 10 | mm |
| | | Use specified discharge coefficient? | No | |
| | | Discharge coefficient | | fraction |
| | Release location | Elevation | 1 | m |
| | | Tank head | 0 | m |
| | Direction | Outdoor release direction | Vertical | |
| | | Outdoor release angle | 90 | deg |
| Material | Material | Material characteristics | Flammable only | |
| | | Material to track | METHANE | |
| | Phase | Phase to be released | Liquid | |
| Discharge parameters | Model settings | Atmospheric expansion method | Closest to initial conditions | |
| | | Is flashing allowed to the orifice? | Allow flashing in the orifice | |
| | Droplet break-up mechanism | Droplet break-up mechanism - continuous | Use flashing correlation | |
| Dispersion | Dispersion scope | Concentration of interest | 19390 | ppm |
| | | Averaging time for concentration of interest | Flammable | |
| | | Specify user-defined averaging time | No | |

| | | | | |
|---|---|---|---|---|
| | | User defined averaging time | | s |
| | Distances of interest | Distances of interest | | m |
| | Averaging time for reports | ERPG [1 hr] | No | |
| | | IDLH [30 mins] | No | |
| | | STEL [15 mins] | No | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| Toxic parameters | Indoor toxic calculations | Specify the downwind building type | Unselected | |
| | | Building type (downwind building type) | Buildings\Building type | |
| | Exposure time data | Set averaging time equal to exposure time | Use a fixed averaging time | |
| | | Cut-off fraction of toxic load for exposure time calculation | 0,05 | fraction |
| | | Cut-off concentration for exposure time calculations | 0 | fraction |
| | Toxic contours | Number of toxic levels | 4 | |
| | | Dose levels | 130000; 1,3E+06; 1,3E+07; 1,3E+08 | |
| | | Probit levels | 2; 3; 4; 10 | |
| | | Lethality levels | 0,001; 0,01; 0,1; 0,99 | fraction |
| Explosion parameters | Explosion method (Consequence calculations only) | Explosion method | TNT | |
| | Ignition | Supply late ignition location | No ignition location | |
| | | Location of late ignition | | m |
| | Vapour liquid method | Use of explosion mass modification factor | Early and late explosions | |
| | | Explosion mass modification factor | 3 | |
| Fireball | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 3 | |
| | | Intensity levels | 4; 12,5; 37,5 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |

| | | | | |
|---|---|---|---|---|
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Mass modification factor | 3 | |
| | | Fireball maximum exposure duration | 20 | s |
| | Calculation method | Fireball model | Recommended | |
| | | TNO model flame temperature | 1726,85 | degC |
| Jet fire | Jet fire method | Jet fire method | Cone model | |
| | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Rate modification factor | 3 | |
| | | Jet fire maximum exposure duration | 20 | s |
| | Cone model data | Correlation | Recommended | |
| | | Horizontal options | Use standard method | |
| | Surface emissive power | Calculation method for surface emissive power | Calculate SEP | |
| | | Flame emissive power | | kW/m2 |
| | | Emissivity fraction | | fraction |
| Pool fire | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |

| | | | | |
|---|---|---|---|---|
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Radiative fraction for general fires | 0,4 | fraction |
| | | Pool fire maximum exposure duration | 20 | s |

# Discharge Report

## Workspace: 17129I_LNG_istr_rev01_04

### Study: Top7_Pipe mandata vaporizzatori

#### Equipment Item: pipe_70bar

17129I_LNG_istr_rev01_04\Top7_Pipe mandata vaporizzatori\pipe_70bar

| | | |
|---|---|---|
| Material | **METHANE** | |
| East | 0 | m |
| North | 0 | m |

### Scenario: Leak_25mm

17129I_LNG_istr_rev01_04\Top7_Pipe mandata vaporizzatori\pipe_70bar\Leak_25mm

**Weather: Category 2/F**

| | |
|---|---|
| **Wind speed [m/s]** | **2** |
| **Pasquill stability** | **F stable - night with moderate clouds and light/moderate wind** |
| **Atmospheric temperature [degC]** | 9,85 |
| **Relative humidity [fraction]** | 0,7 |
| **Solar radiation flux [kW/m2]** | 0,5 |
| **Wind speed at height [m/s]** | **0,568896** |

**Input Data**

**Stagnation Data (data at upstream end for long pipe)**

| | | |
|---|---|---|
| Initial pressure (gauge) | **70** | bar |
| Initial temperature | **-150** | degC |
| Fluid state | **Non-saturated liquid** | |

**Output Data**

**Calculated Quantities**

| | | |
|---|---|---|
| Mass flow rate | 22,2361 | kg/s |
| Release duration | 179,888 | s |

**Orifice or pipe exit data (before atmospheric expansion)**

| | | |
|---|---|---|
| Orifice pressure | 2,02962 | bar |
| Orifice temperature | -152,32 | degC |
| Vena contracta (exit velocity for pipe releases) | 183,811 | m/s |
| Discharge coefficient | 0,603238 | |

**Final Data (after atmospheric expansion)**

| | | |
|---|---|---|
| Final temperature | -161,484 | degC |
| Final liquid mass fraction | 0,937357 | fraction |
| Droplet diameter | 113,429 | um |
| Expanded diameter | **0,0737818** | m |
| Final velocity | 191,695 | m/s |

## Weather: Category 5/D

| | |
|---|---|
| **Wind speed [m/s]** | **5** |
| **Pasquill stability** | **D neutral - little sun and high wind or overcast/windy night** |
| **Atmospheric temperature [degC]** | 9,85 |
| **Relative humidity [fraction]** | 0,7 |
| **Solar radiation flux [kW/m2]** | 0,5 |

| | |
|---|---|
| **Wind speed at height [m/s]** | **2,88131** |

### Input Data

### Stagnation Data (data at upstream end for long pipe)

| | | |
|---|---|---|
| Initial pressure (gauge) | **70** | bar |
| Initial temperature | **-150** | degC |
| Fluid state | **Non-saturated liquid** | |

### Output Data

### Calculated Quantities

| | | |
|---|---|---|
| Mass flow rate | 22,2361 | kg/s |
| Release duration | 179,888 | s |

### Orifice or pipe exit data (before atmospheric expansion)

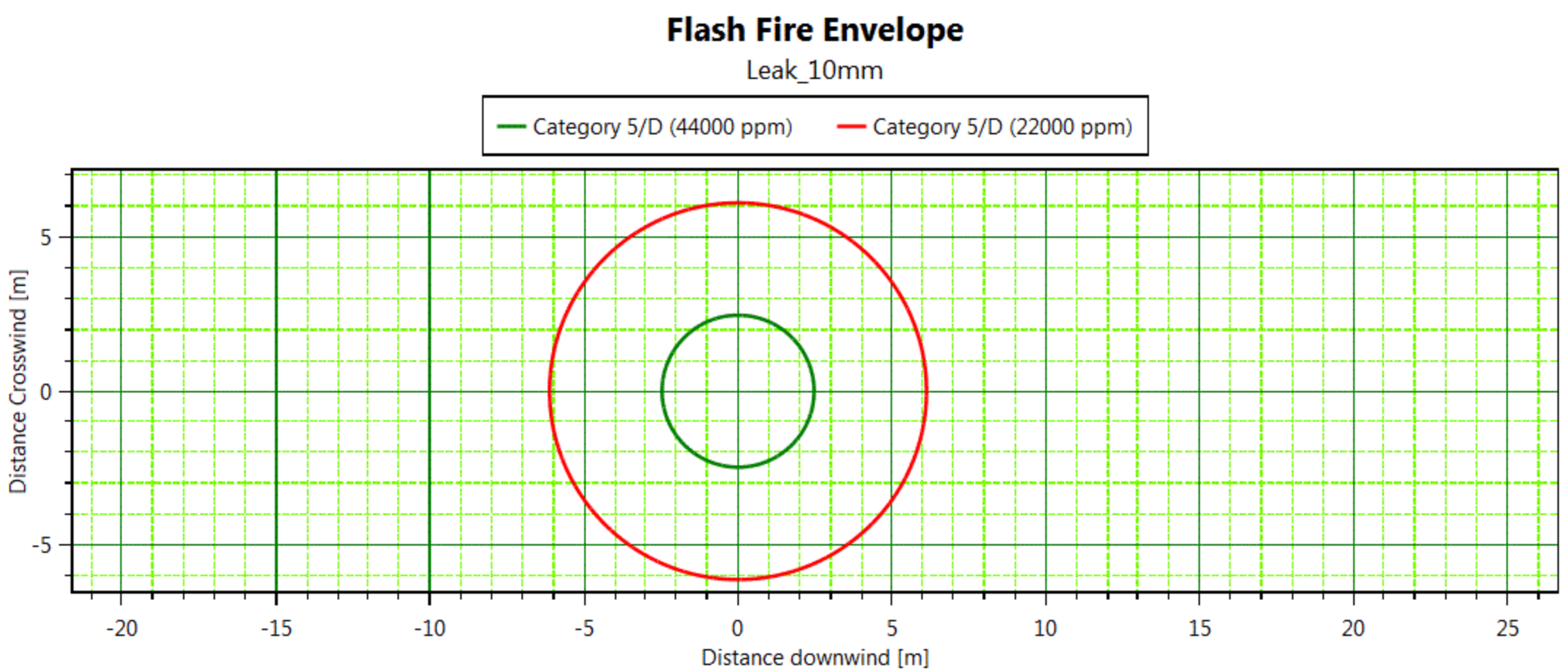
| | | |
|---|---|---|
| Orifice pressure | 2,02962 | bar |
| Orifice temperature | -152,32 | degC |
| Vena contracta (exit velocity for pipe releases) | 183,811 | m/s |
| Discharge coefficient | 0,603238 | |

### Final Data (after atmospheric expansion)

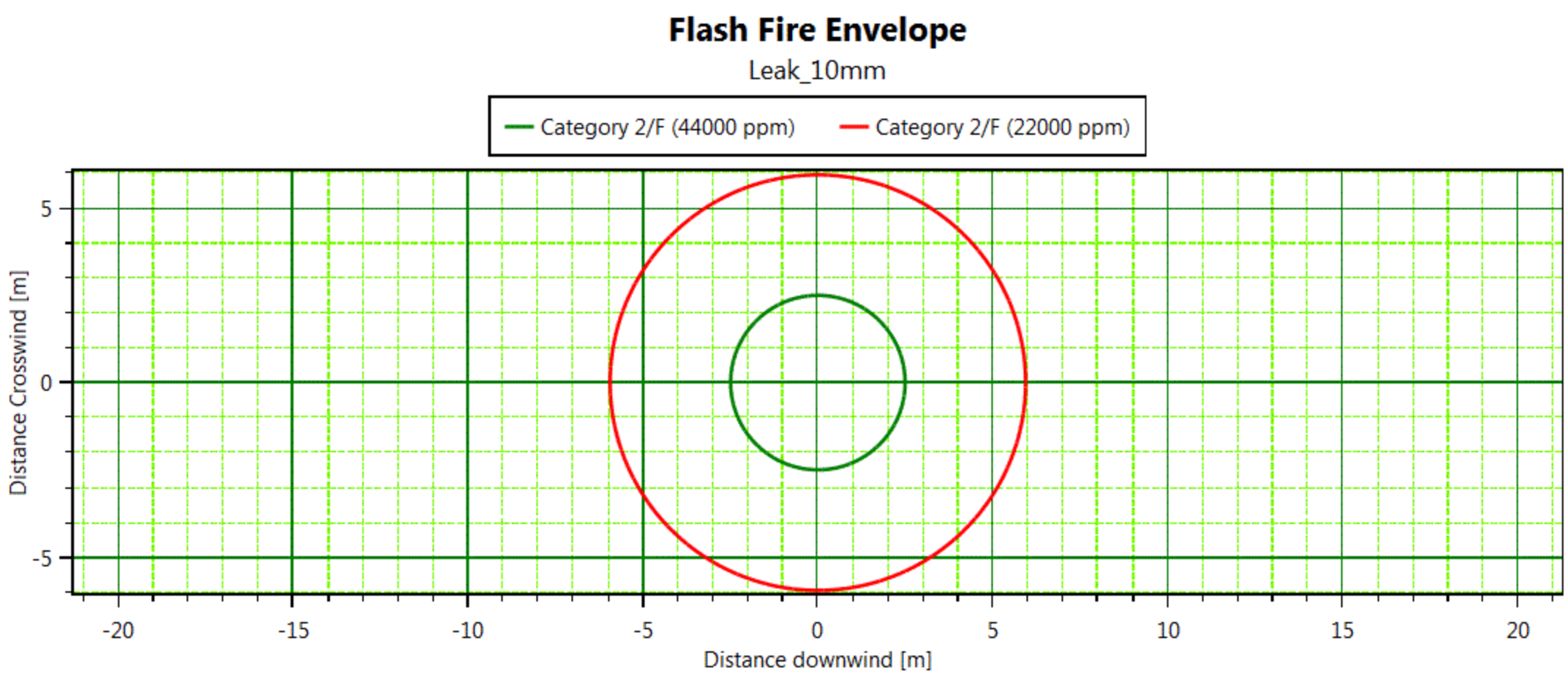
| | | |
|---|---|---|
| Final temperature | -161,484 | degC |
| Final liquid mass fraction | 0,937357 | fraction |
| Droplet diameter | 113,429 | um |
| Expanded diameter | **0,0737818** | m |

| | | |
|---|---|---|
| Final velocity | 191,695 | m/s |

| | |
|---|---|
| Audit Number | 98806 |
| Equipment | pipe_70bar |
| Material | METHANE |
| Program | Phast 7,21 |
| Scenario | Leak_10mm |
| Workspace | 17129I_LNG_istr_rev01_04 |



| | |
|---|---|
| Audit Number | 98806 |
| Equipment | pipe_70bar |
| Material | METHANE |
| Program | Phast 7,21 |
| Scenario | Leak_10mm |
| Workspace | 17129I_LNG_istr_rev01_04 |



# Input Report

## Workspace: 17129I_LNG_istr_rev01_04

### Top7_Pipe mandata vaporizzatori

Study

17129I_LNG_istr_rev01_04

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Context of calculations | Selection of context | Weathers to use for this study | Weather folder | |
| | | Parameters to use for this study | Parameter set | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| Toxic parameters | Indoor toxic calculations | Specify the downwind building type | Unselected | |
| | | Building type (downwind building type) | Buildings\Building type | |
| Dispersion | Distances of interest | Distances of interest | | m |

### pipe_70bar

Pressure vessel

17129I_LNG_istr_rev01_04\Top7_Pipe mandata vaporizzatori

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Material | Material | Material | METHANE | |
| | | Specify volume inventory? | No | |
| | | Mass inventory | 4000 | kg |
| | | Volume inventory | 9,87972 | m3 |
| | | Material to track | METHANE | |
| | Phase | Specified condition | Pressure/temperature | |
| | | Temperature | -150 | degC |
| | | Pressure (gauge) | 70 | bar |
| | | Fluid state | Liquid | |
| | | Liquid mole fraction | 1 | fraction |

| | | | | |
|---|---|---|---|---|
| | | Phase to be released | Liquid | |
| Scenario | Pipe dimensions | Pipe length | | m |
| | Release location | Elevation | 6 | m |
| | | Tank head | 0 | m |
| | | Release height from vessel bottom | | m |
| | Direction | Outdoor release direction | Horizontal | |
| | | Outdoor release angle | 0 | deg |
| Discharge parameters | Model settings | Atmospheric expansion method | Closest to initial conditions | |
| | | Is flashing allowed to the orifice? | Allow flashing in the orifice | |
| | Droplet break-up mechanism | Droplet break-up mechanism - instantaneous | Use flashing correlation | |
| | | Droplet break-up mechanism - continuous | Use flashing correlation | |
| Short pipe | Pipe characteristics | Pipe roughness | 0,0457 | mm |
| | Frequencies | Frequency of bends in pipe | 0 | /m |
| | | Frequency of couplings in pipe | 0 | /m |
| | | Frequency of junctions in pipe | 0 | /m |
| | Frequencies of valves | Frequency of excess flow valves | 0 | /m |
| | | Frequency of non-return valves | 0 | /m |
| | | Frequency of shut-off valves | 0 | /m |
| | Velocity head losses | Excess flow valve velocity head losses | 0 | |
| | | Non-return valve velocity head losses | 0 | |
| | | Shut-off valve velocity head losses | 0 | |
| Time varying releases | Modelling of time-varying leaks and line ruptures | Vacuum relief valve | Operating | |
| | | Vacuum relief valve set point | 0 | bar |
| | Dimensions | Tank shape | | |
| | | Tank height | | m |
| | | Tank width | | m |
| | | Tank length | | m |
| | | Tank diameter | | m |
| | Inventory data | Tank volume | 9,87972 | m3 |
| | | Tank vapour volume | 0 | m3 |
| | | Tank liquid volume | 9,87972 | m3 |

| | | | | |
|---|---|---|---|---|
| | | Tank liquid level | 0 | m |
| | | Maximum vapour release height | | m |
| | | Maximum mass inventory | 1E+09 | kg |
| Dispersion | Dispersion scope | Concentration of interest | 19390 | ppm |
| | | Averaging time for concentration of interest | Flammable | |
| | | Specify user-defined averaging time | No | |
| | | User defined averaging time | | s |
| | Distances of interest | Distances of interest | | m |
| | Averaging time for reports | ERPG [1 hr] | No | |
| | | IDLH [30 mins] | No | |
| | | STEL [15 mins] | No | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| | Building definition | Specify a release building | No | |
| | | Specified building (release building) | | |
| | | Building wake effect | None | |
| | | Wind or release angle from North | 0 | deg |
| | | Handling of droplets | Not trapped | |
| | | Indoor mass modification factor | 3 | |
| Explosion parameters | Explosion method (Consequence calculations only) | Explosion method | TNT | |
| | Ignition | Supply late ignition location | No ignition location | |
| | | Location of late ignition | | m |
| | Vapour liquid method | Use of explosion mass modification factor | Early and late explosions | |
| | | Explosion mass modification factor | 3 | |
| TNT | TNT parameters | Air or ground burst | Air burst | |
| | | Default TNT explosion efficiency | 0,1 | fraction |
| Fireball | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 3 | |

| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 4; 12,5; 37,5 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Mass modification factor | 3 | |
| | | Fireball maximum exposure duration | 20 | s |
| | Calculation method | Fireball model | Recommended | |
| | | TNO model flame temperature | 1726,85 | degC |
| Jet fire | Jet fire method | Jet fire method | Cone model | |
| | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Rate modification factor | 3 | |
| | | Jet fire maximum exposure duration | 20 | s |
| | Cone model data | Crosswind angle | 0 | deg |
| | | Horizontal options | Use standard method | |
| | | Correlation | Recommended | |
| | Surface emissive power | Calculation method for surface emissive power | Calculate SEP | |
| | | Flame emissive power | | kW/m2 |
| | | Emissivity fraction | | fraction |
| Pool fire | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |

| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Radiative fraction for general fires | 0,4 | fraction |
| | | Pool fire maximum exposure duration | 20 | s |
| Geometry | Geometry | East | 0 | m |
| | | North | 0 | m |

## Leak_25mm

Leak

17129I_LNG_istr_rev01_04\Top7_Pipe mandata vaporizzatori\pipe_70bar

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Scenario | Hole | Orifice diameter | 25 | mm |
| | | Use specified discharge coefficient? | No | |
| | | Discharge coefficient | | fraction |
| | Release location | Elevation | 1 | m |
| | | Tank head | 0 | m |
| | Direction | Outdoor release direction | Vertical | |
| | | Outdoor release angle | 90 | deg |
| Material | Material | Material characteristics | Flammable only | |
| | | Material to track | METHANE | |
| | Phase | Phase to be released | Liquid | |
| Discharge parameters | Model settings | Atmospheric expansion method | Closest to initial conditions | |
| | | Is flashing allowed to the orifice? | Allow flashing in the orifice | |
| | Droplet break-up mechanism | Droplet break-up mechanism - continuous | Use flashing correlation | |
| Dispersion | Dispersion scope | Concentration of interest | 19390 | ppm |
| | | Averaging time for concentration of interest | Flammable | |
| | | Specify user-defined averaging time | No | |

| | | | | |
|---|---|---|---|---|
| | | User defined averaging time | | s |
| | Distances of interest | Distances of interest | | m |
| | Averaging time for reports | ERPG [1 hr] | No | |
| | | IDLH [30 mins] | No | |
| | | STEL [15 mins] | No | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| Toxic parameters | Indoor toxic calculations | Specify the downwind building type | Unselected | |
| | | Building type (downwind building type) | Buildings\Building type | |
| | Exposure time data | Set averaging time equal to exposure time | Use a fixed averaging time | |
| | | Cut-off fraction of toxic load for exposure time calculation | 0,05 | fraction |
| | | Cut-off concentration for exposure time calculations | 0 | fraction |
| | Toxic contours | Number of toxic levels | 4 | |
| | | Dose levels | 130000; 1,3E+06; 1,3E+07; 1,3E+08 | |
| | | Probit levels | 2; 3; 4; 10 | |
| | | Lethality levels | 0,001; 0,01; 0,1; 0,99 | fraction |
| Explosion parameters | Explosion method (Consequence calculations only) | Explosion method | TNT | |
| | Ignition | Supply late ignition location | No ignition location | |
| | | Location of late ignition | | m |
| | Vapour liquid method | Use of explosion mass modification factor | Early and late explosions | |
| | | Explosion mass modification factor | 3 | |
| TNT | TNT parameters | Air or ground burst | Air burst | |
| | | Default TNT explosion efficiency | 0,1 | fraction |
| Fireball | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 3 | |

| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 4; 12,5; 37,5 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Mass modification factor | 3 | |
| | | Fireball maximum exposure duration | 20 | s |
| | Calculation method | Fireball model | Recommended | |
| | | TNO model flame temperature | 1726,85 | degC |
| Jet fire | Jet fire method | Jet fire method | Cone model | |
| | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Rate modification factor | 3 | |
| | | Jet fire maximum exposure duration | 20 | s |
| | Cone model data | Correlation | Recommended | |
| | | Horizontal options | Use standard method | |
| | Surface emissive power | Calculation method for surface emissive power | Calculate SEP | |
| | | Flame emissive power | | kW/m2 |
| | | Emissivity fraction | | fraction |
| Pool fire | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |

| | | | | |
|---|---|---|---|---|
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Radiative fraction for general fires | 0,4 | fraction |
| | | Pool fire maximum exposure duration | 20 | s |

# Discharge Report

## Workspace: 17129I_LNG_istr_rev01_04

### Study: Top7_Pipe mandata vaporizzatori

#### Equipment Item: pipe_70bar

17129I_LNG_istr_rev01_04\Top7_Pipe mandata vaporizzatori\pipe_70bar

| | | |
|---|---|---|
| Material | **METHANE** | |
| East | 0 | m |
| North | 0 | m |

### Scenario: Leak_25mm

17129I_LNG_istr_rev01_04\Top7_Pipe mandata vaporizzatori\pipe_70bar\Leak_25mm

**Weather: Category 2/F**

| | |
|---|---|
| **Wind speed [m/s]** | **2** |
| **Pasquill stability** | **F stable - night with moderate clouds and light/moderate wind** |
| **Atmospheric temperature [degC]** | 9,85 |
| **Relative humidity [fraction]** | 0,7 |
| **Solar radiation flux [kW/m2]** | 0,5 |
| **Wind speed at height [m/s]** | **0,568896** |

**Input Data**

**Stagnation Data (data at upstream end for long pipe)**

| | | |
|---|---|---|
| Initial pressure (gauge) | **70** | bar |
| Initial temperature | **-150** | degC |
| Fluid state | **Non-saturated liquid** | |

**Output Data**

**Calculated Quantities**

| | | |
|---|---|---|
| Mass flow rate | 22,2361 | kg/s |
| Release duration | 179,888 | s |

**Orifice or pipe exit data (before atmospheric expansion)**

| | | |
|---|---|---|
| Orifice pressure | 2,02962 | bar |
| Orifice temperature | -152,32 | degC |
| Vena contracta (exit velocity for pipe releases) | 183,811 | m/s |
| Discharge coefficient | 0,603238 | |

**Final Data (after atmospheric expansion)**

| | | |
|---|---|---|
| Final temperature | -161,484 | degC |
| Final liquid mass fraction | 0,937357 | fraction |
| Droplet diameter | 113,429 | um |
| Expanded diameter | **0,0737818** | m |
| Final velocity | 191,695 | m/s |

## Weather: Category 5/D

| | |
|---|---|
| **Wind speed [m/s]** | **5** |
| **Pasquill stability** | **D neutral - little sun and high wind or overcast/windy night** |
| **Atmospheric temperature [degC]** | 9,85 |
| **Relative humidity [fraction]** | 0,7 |
| **Solar radiation flux [kW/m2]** | 0,5 |

| | |
|---|---|
| **Wind speed at height [m/s]** | **2,88131** |

### Input Data

### Stagnation Data (data at upstream end for long pipe)

| | | |
|---|---|---|
| Initial pressure (gauge) | **70** | bar |
| Initial temperature | **-150** | degC |
| Fluid state | **Non-saturated liquid** | |

### Output Data

### Calculated Quantities

| | | |
|---|---|---|
| Mass flow rate | 22,2361 | kg/s |
| Release duration | 179,888 | s |

### Orifice or pipe exit data (before atmospheric expansion)

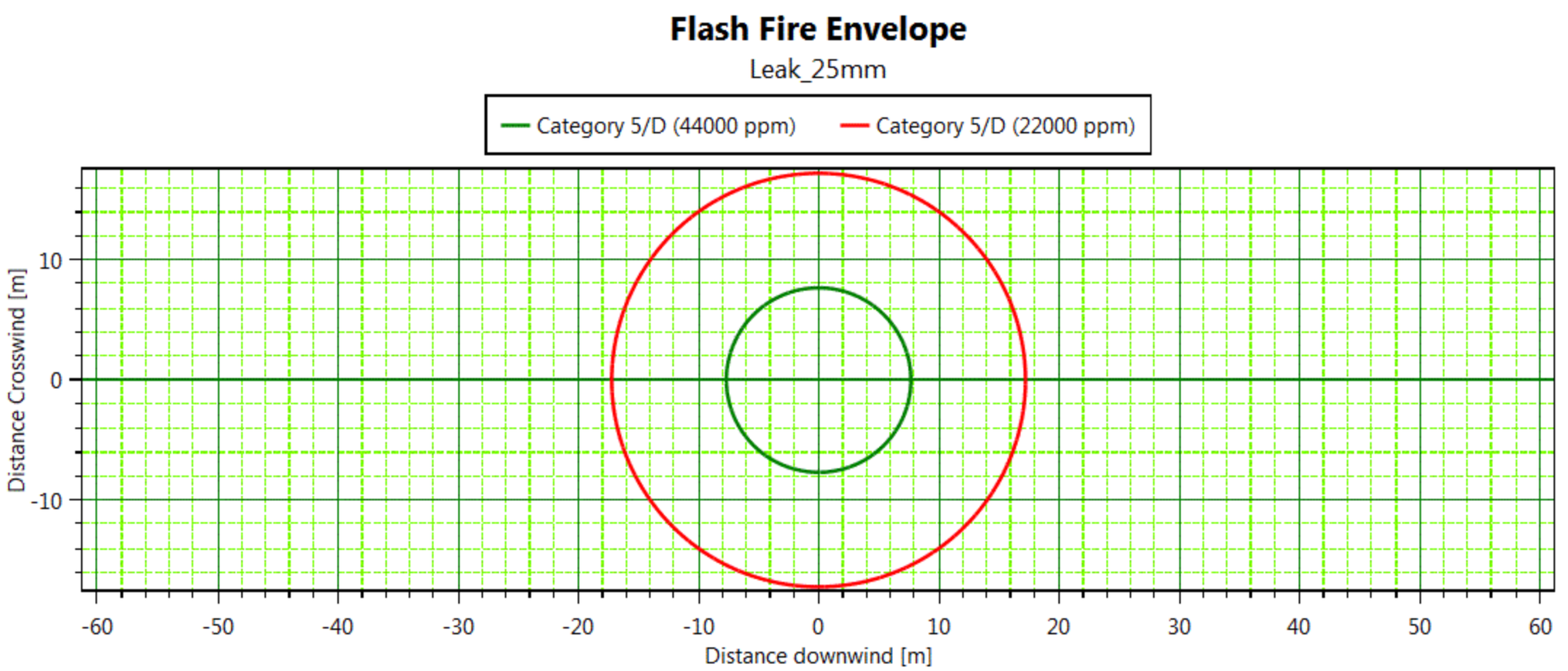
| | | |
|---|---|---|
| Orifice pressure | 2,02962 | bar |
| Orifice temperature | -152,32 | degC |
| Vena contracta (exit velocity for pipe releases) | 183,811 | m/s |
| Discharge coefficient | 0,603238 | |

### Final Data (after atmospheric expansion)

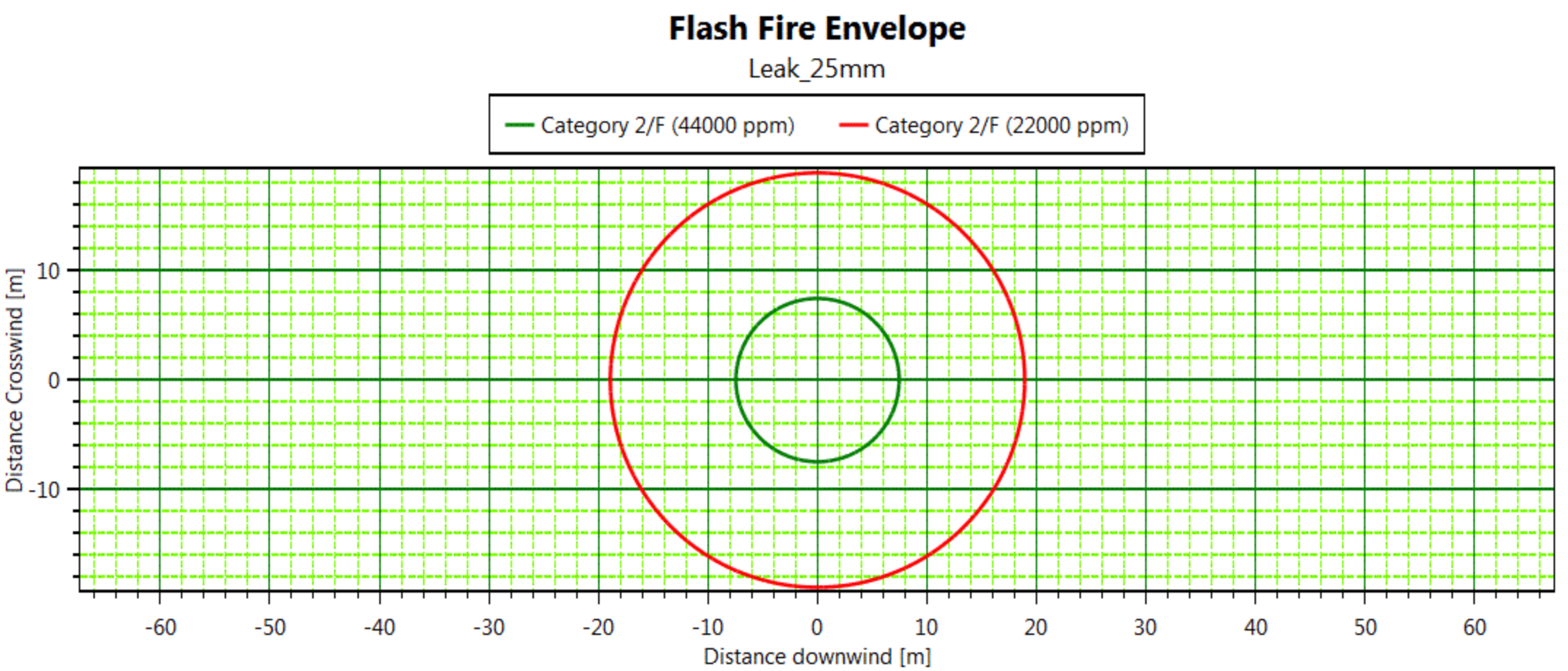
| | | |
|---|---|---|
| Final temperature | -161,484 | degC |
| Final liquid mass fraction | 0,937357 | fraction |
| Droplet diameter | 113,429 | um |
| Expanded diameter | **0,0737818** | m |

| | | |
|---|---|---|
| Final velocity | 191,695 | m/s |

| | |
|---|---|
| Audit Number | 98806 |
| Equipment | pipe_70bar |
| Material | METHANE |
| Program | Phast 7,21 |
| Scenario | Leak_25mm |
| Workspace | 17129I_LNG_istr_rev01_04 |



| | |
|---|---|
| Audit Number | 98806 |
| Equipment | pipe_70bar |
| Material | METHANE |
| Program | Phast 7,21 |
| Scenario | Leak_25mm |
| Workspace | 17129I_LNG_istr_rev01_04 |



# Input Report

## Workspace: 17129I_LNG_rev00

### Top8_Pipe mandata rete

Study

17129I_LNG_rev00

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Context of calculations | Selection of context | Weathers to use for this study | Weather folder | |
| | | Parameters to use for this study | Parameter set | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| Toxic parameters | Indoor toxic calculations | Specify the downwind building type | Unselected | |
| | | Building type (downwind building type) | Buildings\Building type | |
| Dispersion | Distances of interest | Distances of interest | | m |

### pipe_70bar

Pressure vessel

17129I_LNG_rev00\Top8_Pipe mandata rete

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Material | Material | Material | METHANE | |
| | | Specify volume inventory? | No | |
| | | Mass inventory | 1100 | kg |
| | | Volume inventory | 18,5498 | m3 |
| | | Material to track | METHANE | |
| | Phase | Specified condition | Pressure/temperature | |
| | | Temperature | 0 | degC |
| | | Pressure (gauge) | 70 | bar |
| | | Fluid state | Vapour | |
| | | Liquid mole fraction | 0 | fraction |

| | | Phase to be released | Vapour | |
|---|---|---|---|---|
| Scenario | Pipe dimensions | Pipe length | | m |
| | Release location | Elevation | 1 | m |
| | | Tank head | 0 | m |
| | | Release height from vessel bottom | | m |
| | Direction | Outdoor release direction | Horizontal | |
| | | Outdoor release angle | 0 | deg |
| Discharge parameters | Model settings | Atmospheric expansion method | Closest to initial conditions | |
| | | Is flashing allowed to the orifice? | Allow flashing in the orifice | |
| | Droplet break-up mechanism | Droplet break-up mechanism - instantaneous | Use flashing correlation | |
| | | Droplet break-up mechanism - continuous | Use flashing correlation | |
| Short pipe | Pipe characteristics | Pipe roughness | 0,0457 | mm |
| | Frequencies | Frequency of bends in pipe | 0 | /m |
| | | Frequency of couplings in pipe | 0 | /m |
| | | Frequency of junctions in pipe | 0 | /m |
| | Frequencies of valves | Frequency of excess flow valves | 0 | /m |
| | | Frequency of non-return valves | 0 | /m |
| | | Frequency of shut-off valves | 0 | /m |
| | Velocity head losses | Excess flow valve velocity head losses | 0 | |
| | | Non-return valve velocity head losses | 0 | |
| | | Shut-off valve velocity head losses | 0 | |
| Time varying releases | Modelling of time-varying leaks and line ruptures | Vacuum relief valve | Operating | |
| | | Vacuum relief valve set point | 0 | bar |
| | Dimensions | Tank shape | | |
| | | Tank height | | m |
| | | Tank width | | m |
| | | Tank length | | m |
| | | Tank diameter | | m |
| | Inventory data | Tank volume | 18,5498 | m3 |
| | | Tank vapour volume | 18,5498 | m3 |
| | | Tank liquid volume | 0 | m3 |

| | | | | |
|---|---|---|---|---|
| | | Tank liquid level | 0 | m |
| | | Maximum vapour release height | | m |
| | | Maximum mass inventory | 1E+09 | kg |
| Dispersion | Dispersion scope | Concentration of interest | 19390 | ppm |
| | | Averaging time for concentration of interest | Flammable | |
| | | Specify user-defined averaging time | No | |
| | | User defined averaging time | | s |
| | Distances of interest | Distances of interest | | m |
| | Averaging time for reports | ERPG [1 hr] | No | |
| | | IDLH [30 mins] | No | |
| | | STEL [15 mins] | No | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| | Building definition | Specify a release building | No | |
| | | Specified building (release building) | | |
| | | Building wake effect | None | |
| | | Wind or release angle from North | 0 | deg |
| | | Handling of droplets | Not trapped | |
| | | Indoor mass modification factor | 3 | |
| Explosion parameters | Explosion method (Consequence calculations only) | Explosion method | TNT | |
| | Ignition | Supply late ignition location | No ignition location | |
| | | Location of late ignition | | m |
| | Vapour liquid method | Use of explosion mass modification factor | Early and late explosions | |
| | | Explosion mass modification factor | 3 | |
| TNT | TNT parameters | Air or ground burst | Air burst | |
| | | Default TNT explosion efficiency | 0,1 | fraction |
| Fireball | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 3 | |

| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 4; 12,5; 37,5 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Mass modification factor | 3 | |
| | | Fireball maximum exposure duration | 20 | s |
| | Calculation method | Fireball model | Recommended | |
| | | TNO model flame temperature | 1726,85 | degC |
| Jet fire | Jet fire method | Jet fire method | Cone model | |
| | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Rate modification factor | 3 | |
| | | Jet fire maximum exposure duration | 20 | s |
| | Cone model data | Crosswind angle | 0 | deg |
| | | Horizontal options | Use standard method | |
| | | Correlation | Recommended | |
| | Surface emissive power | Calculation method for surface emissive power | Calculate SEP | |
| | | Flame emissive power | | kW/m2 |
| | | Emissivity fraction | | fraction |
| Pool fire | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |

| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Radiative fraction for general fires | 0,4 | fraction |
| | | Pool fire maximum exposure duration | 20 | s |
| Geometry | Geometry | East | 0 | m |
| | | North | 0 | m |

## Leak_25

Leak

17129I_LNG_rev00\Top8_Pipe mandata rete\pipe_70bar

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Scenario | Hole | Orifice diameter | 25 | mm |
| | | Use specified discharge coefficient? | No | |
| | | Discharge coefficient | | fraction |
| | Release location | Elevation | 1 | m |
| | | Tank head | 0 | m |
| | Direction | Outdoor release direction | Horizontal | |
| | | Outdoor release angle | 0 | deg |
| Material | Material | Material characteristics | Flammable only | |
| | | Material to track | METHANE | |
| | Phase | Phase to be released | Vapour | |
| Discharge parameters | Model settings | Atmospheric expansion method | Closest to initial conditions | |
| | | Is flashing allowed to the orifice? | Allow flashing in the orifice | |
| | Droplet break-up mechanism | Droplet break-up mechanism - continuous | Use flashing correlation | |
| Dispersion | Dispersion scope | Concentration of interest | 19390 | ppm |
| | | Averaging time for concentration of interest | Flammable | |
| | | Specify user-defined averaging time | No | |

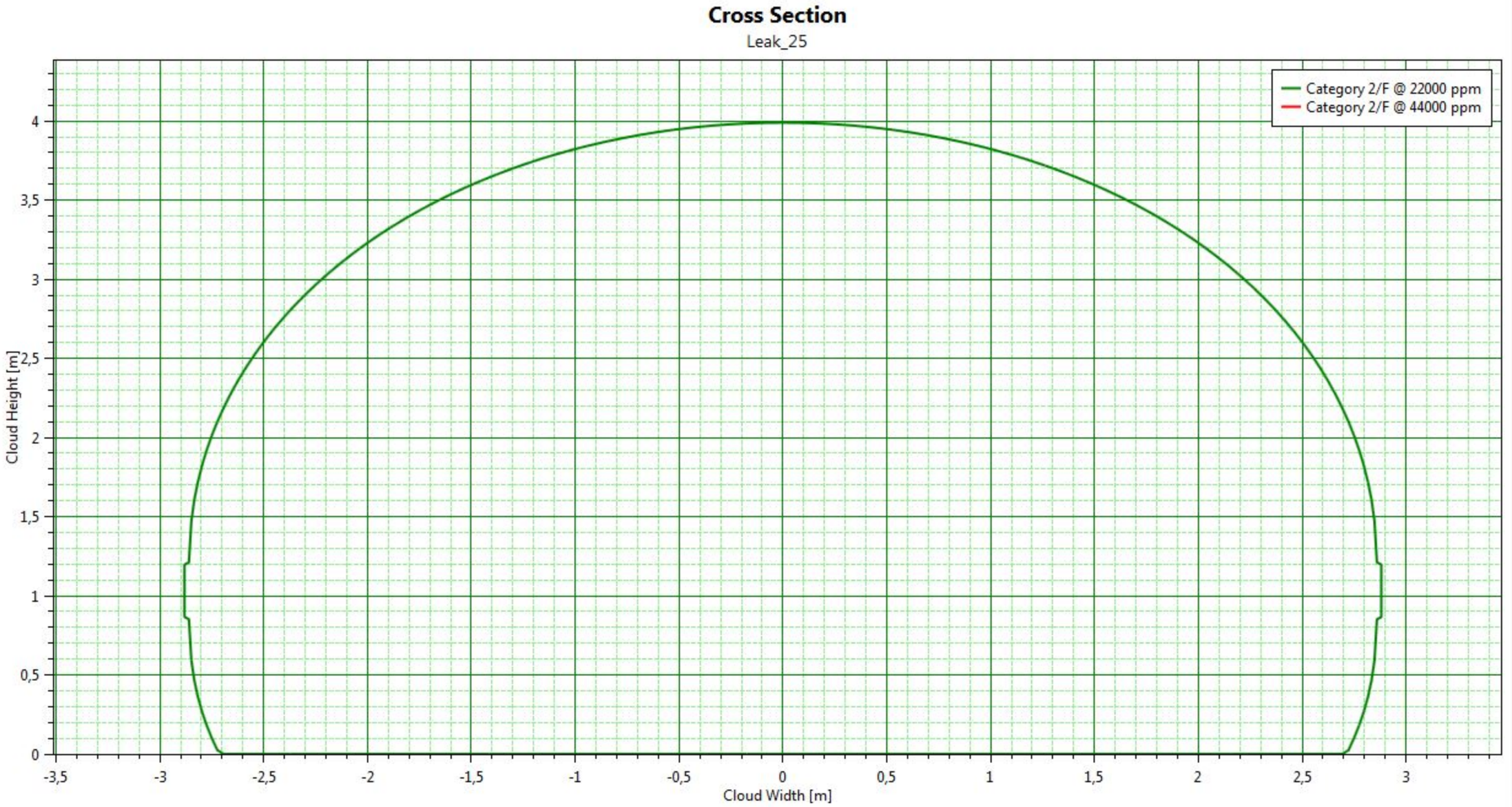
| | | | | |
|---|---|---|---|---|
| | | User defined averaging time | | s |
| | Distances of interest | Distances of interest | | m |
| | Averaging time for reports | ERPG [1 hr] | No | |
| | | IDLH [30 mins] | No | |
| | | STEL [15 mins] | No | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| Toxic parameters | Indoor toxic calculations | Specify the downwind building type | Unselected | |
| | | Building type (downwind building type) | Buildings\Building type | |
| | Exposure time data | Set averaging time equal to exposure time | Use a fixed averaging time | |
| | | Cut-off fraction of toxic load for exposure time calculation | 0,05 | fraction |
| | | Cut-off concentration for exposure time calculations | 0 | fraction |
| | Toxic contours | Number of toxic levels | 4 | |
| | | Dose levels | 130000; 1,3E+06; 1,3E+07; 1,3E+08 | |
| | | Probit levels | 2; 3; 4; 10 | |
| | | Lethality levels | 0,001; 0,01; 0,1; 0,99 | fraction |
| Explosion parameters | Explosion method (Consequence calculations only) | Explosion method | TNT | |
| | Ignition | Supply late ignition location | No ignition location | |
| | | Location of late ignition | | m |
| | Vapour liquid method | Use of explosion mass modification factor | Early and late explosions | |
| | | Explosion mass modification factor | 3 | |
| TNT | TNT parameters | Air or ground burst | Air burst | |
| | | Default TNT explosion efficiency | 0,1 | fraction |
| Fireball | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 3 | |

| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 4; 12,5; 37,5 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Mass modification factor | 3 | |
| | | Fireball maximum exposure duration | 20 | s |
| | Calculation method | Fireball model | Recommended | |
| | | TNO model flame temperature | 1726,85 | degC |
| Jet fire | Jet fire method | Jet fire method | Cone model | |
| | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Rate modification factor | 3 | |
| | | Jet fire maximum exposure duration | 20 | s |
| | Cone model data | Correlation | Recommended | |
| | | Horizontal options | Use standard method | |
| | Surface emissive power | Calculation method for surface emissive power | Calculate SEP | |
| | | Flame emissive power | | kW/m2 |
| | | Emissivity fraction | | fraction |
| Pool fire | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |

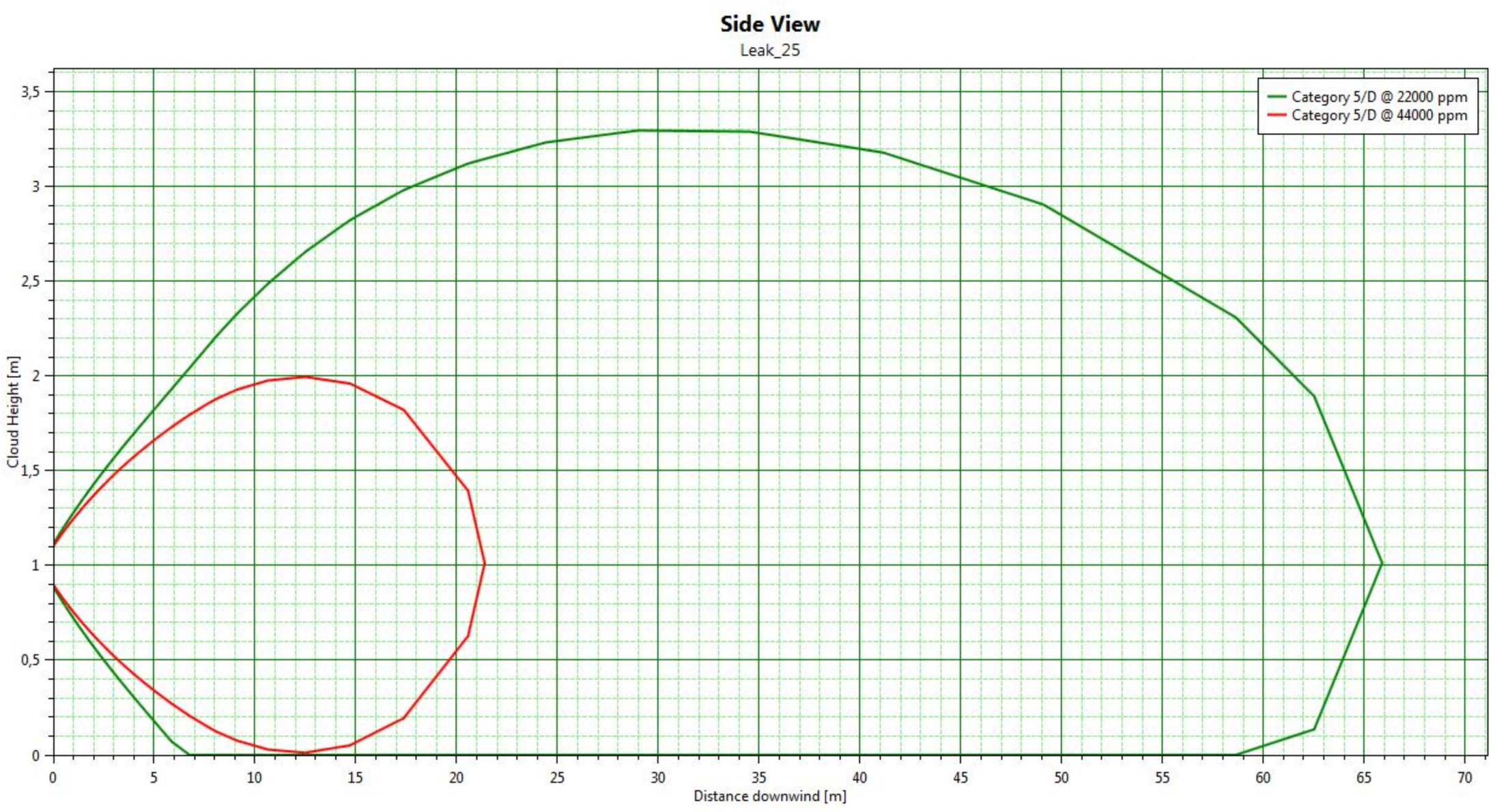
| | | | | |
|---|---|---|---|---|
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Radiative fraction for general fires | 0,4 | fraction |
| | | Pool fire maximum exposure duration | 20 | s |

| | |
|---|---|
| Audit Number | 94428 |
| Averaging time | Flammable (18,75 s) |
| Equipment | pipe_70bar |
| Material | METHANE |
| Reference | METHANE |
| Offset Distance | 0 m |
| Program | Phast 7,21 |
| Scenario | Leak_25 |
| Time | 12,7524 s |
| Weather | Category 2/F |
| Workspace | 17129I_LNG_rev00 |

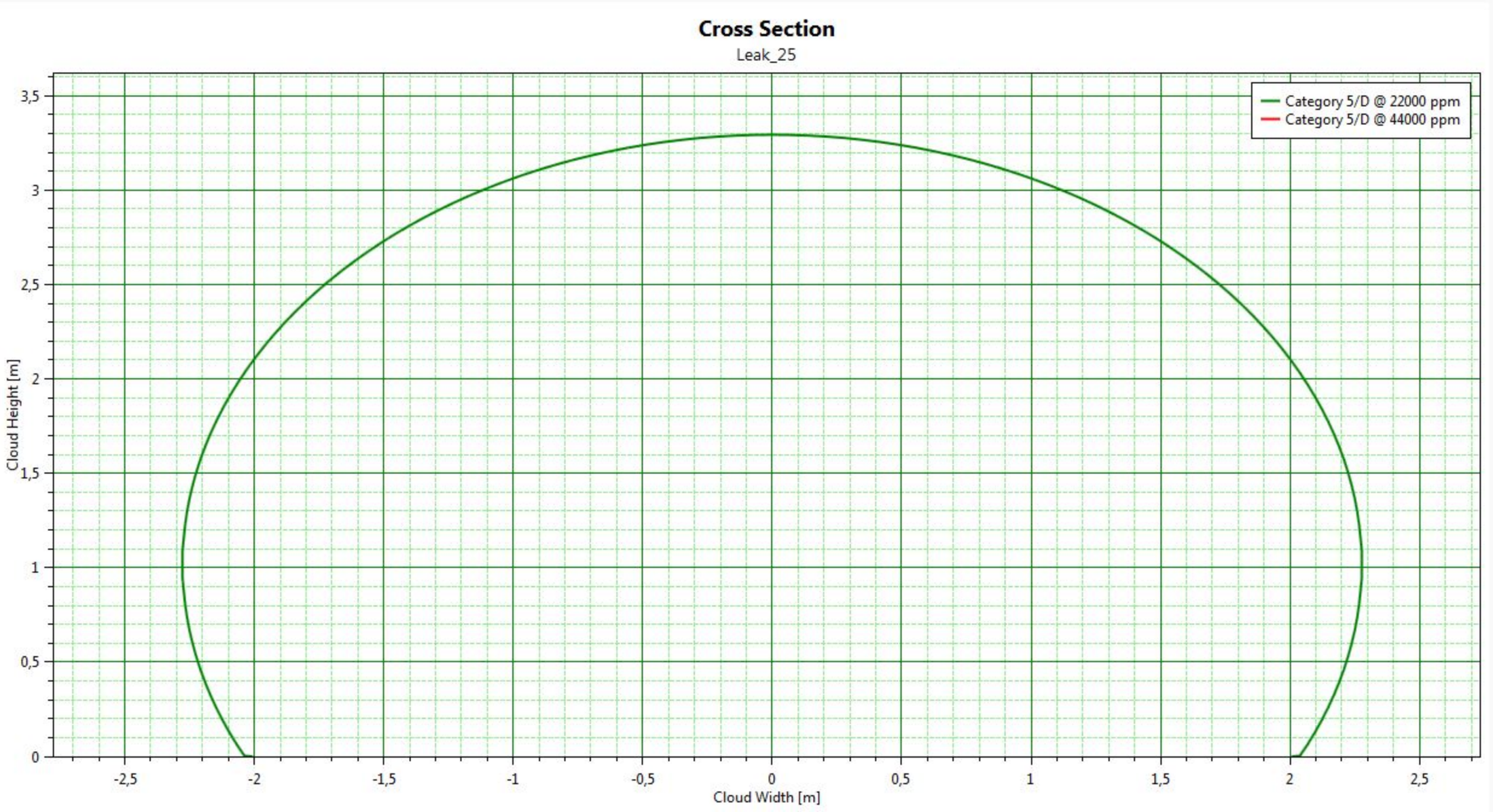
| | |
|---|---|
| Audit Number | 94428 |
| Averaging time | Flammable (18,75 s) |
| Downwind Distance | 30 m |
| Equipment | pipe_70bar |
| Material | METHANE |
| Reference | METHANE |
| Program | Phast 7,21 |
| Scenario | Leak_25 |
| Time | 12,7524 s |
| Weather | Category 2/F |
| Workspace | 17129I_LNG_rev00 |



| | |
|---|---|
| Audit Number | 94428 |
| Averaging time | Flammable (18,75 s) |
| Equipment | pipe_70bar |
| Material | METHANE |
| Reference | METHANE |
| Offset Distance | 0 m |
| Program | Phast 7,21 |
| Scenario | Leak_25 |
| Time | 8,64015 s |
| Weather | Category 5/D |
| Workspace | 17129I_LNG_rev00 |



| | |
|---|---|
| Audit Number | 94428 |
| Averaging time | Flammable (18,75 s) |
| Downwind Distance | 30 m |
| Equipment | pipe_70bar |
| Material | METHANE |
| Reference | METHANE |
| Program | Phast 7,21 |
| Scenario | Leak_25 |
| Time | 8,64015 s |
| Weather | Category 5/D |
| Workspace | 17129I_LNG_rev00 |



# Input Report

## Workspace: 17129I_LNG_rev00

### Top9_Pipe BOG

Study

17129I_LNG_rev00

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Context of calculations | Selection of context | Weathers to use for this study | Weather folder | |
| | | Parameters to use for this study | Parameter set | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| Toxic parameters | Indoor toxic calculations | Specify the downwind building type | Unselected | |
| | | Building type (downwind building type) | Buildings\Building type | |
| Dispersion | Distances of interest | Distances of interest | | m |

### pipe

Pressure vessel

17129I_LNG_rev00\Top9_Pipe BOG

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Material | Material | Material | METHANE | |
| | | Specify volume inventory? | No | |
| | | Mass inventory | 5 | kg |
| | | Volume inventory | 0,550989 | m3 |
| | | Material to track | METHANE | |
| | Phase | Specified condition | Pressure/temperature | |
| | | Temperature | -130 | degC |
| | | Pressure (gauge) | 5 | bar |
| | | Fluid state | Vapour | |
| | | Liquid mole fraction | 0 | fraction |

| | | Phase to be released | Vapour | |
|---|---|---|---|---|
| Scenario | Pipe dimensions | Pipe length | | m |
| | Release location | Elevation | 1 | m |
| | | Tank head | 0 | m |
| | | Release height from vessel bottom | | m |
| | Direction | Outdoor release direction | Horizontal | |
| | | Outdoor release angle | 0 | deg |
| Discharge parameters | Model settings | Atmospheric expansion method | Closest to initial conditions | |
| | | Is flashing allowed to the orifice? | Allow flashing in the orifice | |
| | Droplet break-up mechanism | Droplet break-up mechanism - instantaneous | Use flashing correlation | |
| | | Droplet break-up mechanism - continuous | Use flashing correlation | |
| Short pipe | Pipe characteristics | Pipe roughness | 0,0457 | mm |
| | Frequencies | Frequency of bends in pipe | 0 | /m |
| | | Frequency of couplings in pipe | 0 | /m |
| | | Frequency of junctions in pipe | 0 | /m |
| | Frequencies of valves | Frequency of excess flow valves | 0 | /m |
| | | Frequency of non-return valves | 0 | /m |
| | | Frequency of shut-off valves | 0 | /m |
| | Velocity head losses | Excess flow valve velocity head losses | 0 | |
| | | Non-return valve velocity head losses | 0 | |
| | | Shut-off valve velocity head losses | 0 | |
| Time varying releases | Modelling of time-varying leaks and line ruptures | Vacuum relief valve | Operating | |
| | | Vacuum relief valve set point | 0 | bar |
| | Dimensions | Tank shape | | |
| | | Tank height | | m |
| | | Tank width | | m |
| | | Tank length | | m |
| | | Tank diameter | | m |
| | Inventory data | Tank volume | 0,550989 | m3 |
| | | Tank vapour volume | 0,550989 | m3 |
| | | Tank liquid volume | 0 | m3 |

| | | | | |
|---|---|---|---|---|
| | | Tank liquid level | 0 | m |
| | | Maximum vapour release height | | m |
| | | Maximum mass inventory | 1E+09 | kg |
| Dispersion | Dispersion scope | Concentration of interest | 19390 | ppm |
| | | Averaging time for concentration of interest | Flammable | |
| | | Specify user-defined averaging time | No | |
| | | User defined averaging time | | s |
| | Distances of interest | Distances of interest | | m |
| | Averaging time for reports | ERPG [1 hr] | No | |
| | | IDLH [30 mins] | No | |
| | | STEL [15 mins] | No | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| | Building definition | Specify a release building | No | |
| | | Specified building (release building) | | |
| | | Building wake effect | None | |
| | | Wind or release angle from North | 0 | deg |
| | | Handling of droplets | Not trapped | |
| | | Indoor mass modification factor | 3 | |
| Explosion parameters | Explosion method (Consequence calculations only) | Explosion method | TNT | |
| | Ignition | Supply late ignition location | No ignition location | |
| | | Location of late ignition | | m |
| | Vapour liquid method | Use of explosion mass modification factor | Early and late explosions | |
| | | Explosion mass modification factor | 3 | |
| TNT | TNT parameters | Air or ground burst | Air burst | |
| | | Default TNT explosion efficiency | 0,1 | fraction |
| Fireball | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 3 | |

| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 4; 12,5; 37,5 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Mass modification factor | 3 | |
| | | Fireball maximum exposure duration | 20 | s |
| | Calculation method | Fireball model | Recommended | |
| | | TNO model flame temperature | 1726,85 | degC |
| Jet fire | Jet fire method | Jet fire method | Cone model | |
| | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Rate modification factor | 3 | |
| | | Jet fire maximum exposure duration | 20 | s |
| | Cone model data | Crosswind angle | 0 | deg |
| | | Horizontal options | Use standard method | |
| | | Correlation | Recommended | |
| | Surface emissive power | Calculation method for surface emissive power | Calculate SEP | |
| | | Flame emissive power | | kW/m2 |
| | | Emissivity fraction | | fraction |
| Pool fire | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |

| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Radiative fraction for general fires | 0,4 | fraction |
| | | Pool fire maximum exposure duration | 20 | s |
| Geometry | Geometry | East | 0 | m |
| | | North | 0 | m |

## Leak_5mm

Leak

17129I_LNG_rev00\Top9_Pipe BOG\pipe

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Scenario | Hole | Orifice diameter | 5 | mm |
| | | Use specified discharge coefficient? | No | |
| | | Discharge coefficient | | fraction |
| | Release location | Elevation | 3 | m |
| | | Tank head | 0 | m |
| | Direction | Outdoor release direction | Horizontal | |
| | | Outdoor release angle | 0 | deg |
| Material | Material | Material characteristics | Flammable only | |
| | | Material to track | METHANE | |
| | Phase | Phase to be released | Vapour | |
| Discharge parameters | Model settings | Atmospheric expansion method | Closest to initial conditions | |
| | | Is flashing allowed to the orifice? | Allow flashing in the orifice | |
| | Droplet break-up mechanism | Droplet break-up mechanism - continuous | Use flashing correlation | |
| Dispersion | Dispersion scope | Concentration of interest | 19390 | ppm |
| | | Averaging time for concentration of interest | Flammable | |
| | | Specify user-defined averaging time | No | |

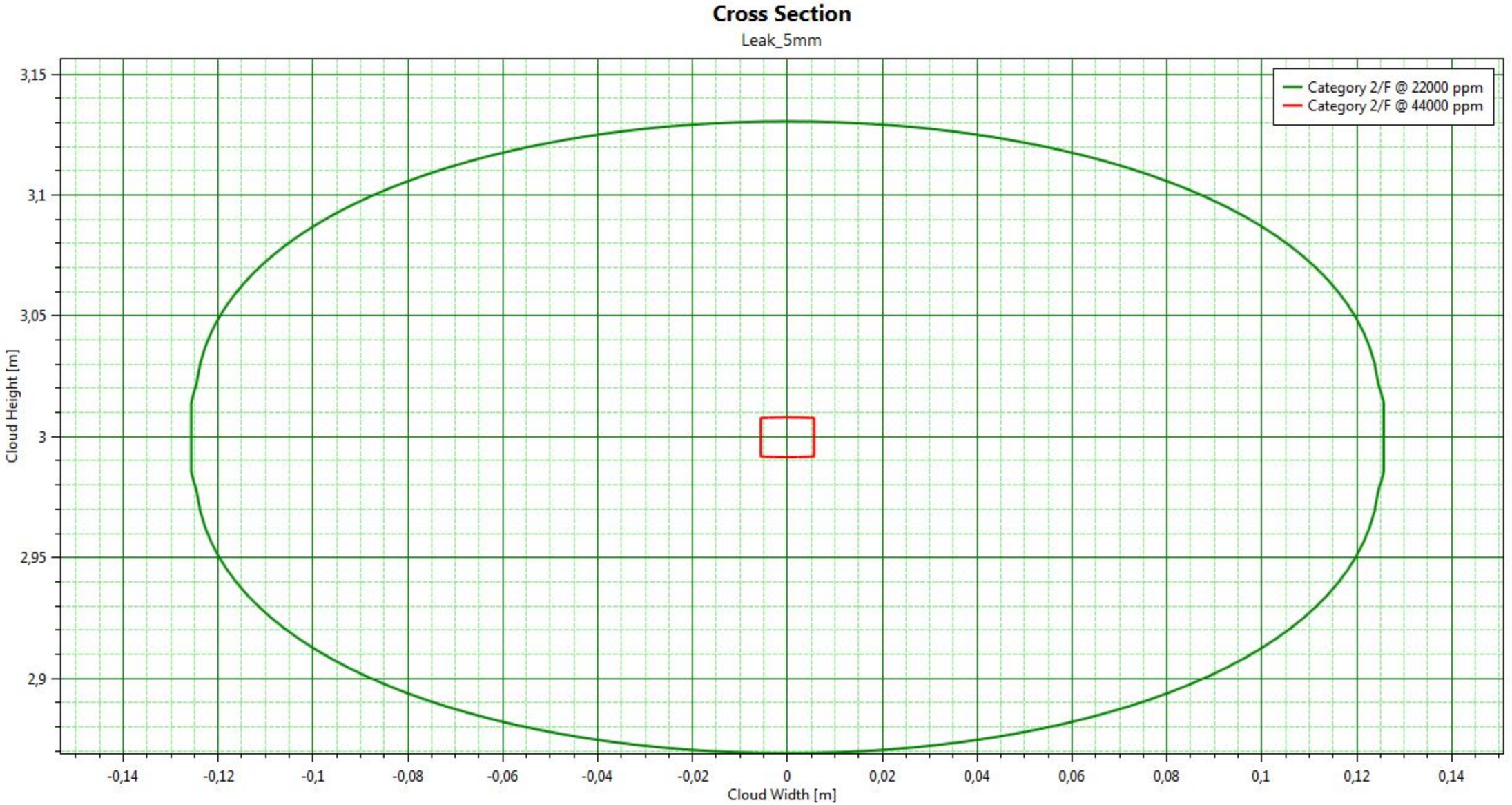
| | | | | |
|---|---|---|---|---|
| | | User defined averaging time | | s |
| | Distances of interest | Distances of interest | | m |
| | Averaging time for reports | ERPG [1 hr] | No | |
| | | IDLH [30 mins] | No | |
| | | STEL [15 mins] | No | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| Toxic parameters | Indoor toxic calculations | Specify the downwind building type | Unselected | |
| | | Building type (downwind building type) | Buildings\Building type | |
| | Exposure time data | Set averaging time equal to exposure time | Use a fixed averaging time | |
| | | Cut-off fraction of toxic load for exposure time calculation | 0,05 | fraction |
| | | Cut-off concentration for exposure time calculations | 0 | fraction |
| | Toxic contours | Number of toxic levels | 4 | |
| | | Dose levels | 130000; 1,3E+06; 1,3E+07; 1,3E+08 | |
| | | Probit levels | 2; 3; 4; 10 | |
| | | Lethality levels | 0,001; 0,01; 0,1; 0,99 | fraction |
| Explosion parameters | Explosion method (Consequence calculations only) | Explosion method | TNT | |
| | Ignition | Supply late ignition location | No ignition location | |
| | | Location of late ignition | | m |
| | Vapour liquid method | Use of explosion mass modification factor | Early and late explosions | |
| | | Explosion mass modification factor | 3 | |
| Fireball | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 3 | |
| | | Intensity levels | 4; 12,5; 37,5 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |

| | | | | |
|---|---|---|---|---|
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Mass modification factor | 3 | |
| | | Fireball maximum exposure duration | 20 | s |
| | Calculation method | Fireball model | Recommended | |
| | | TNO model flame temperature | 1726,85 | degC |
| Jet fire | Jet fire method | Jet fire method | Cone model | |
| | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Rate modification factor | 3 | |
| | | Jet fire maximum exposure duration | 20 | s |
| | Cone model data | Correlation | Recommended | |
| | | Horizontal options | Use standard method | |
| | Surface emissive power | Calculation method for surface emissive power | Calculate SEP | |
| | | Flame emissive power | | kW/m2 |
| | | Emissivity fraction | | fraction |
| Pool fire | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |

| | | | | |
|---|---|---|---|---|
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Radiative fraction for general fires | 0,4 | fraction |
| | | Pool fire maximum exposure duration | 20 | s |

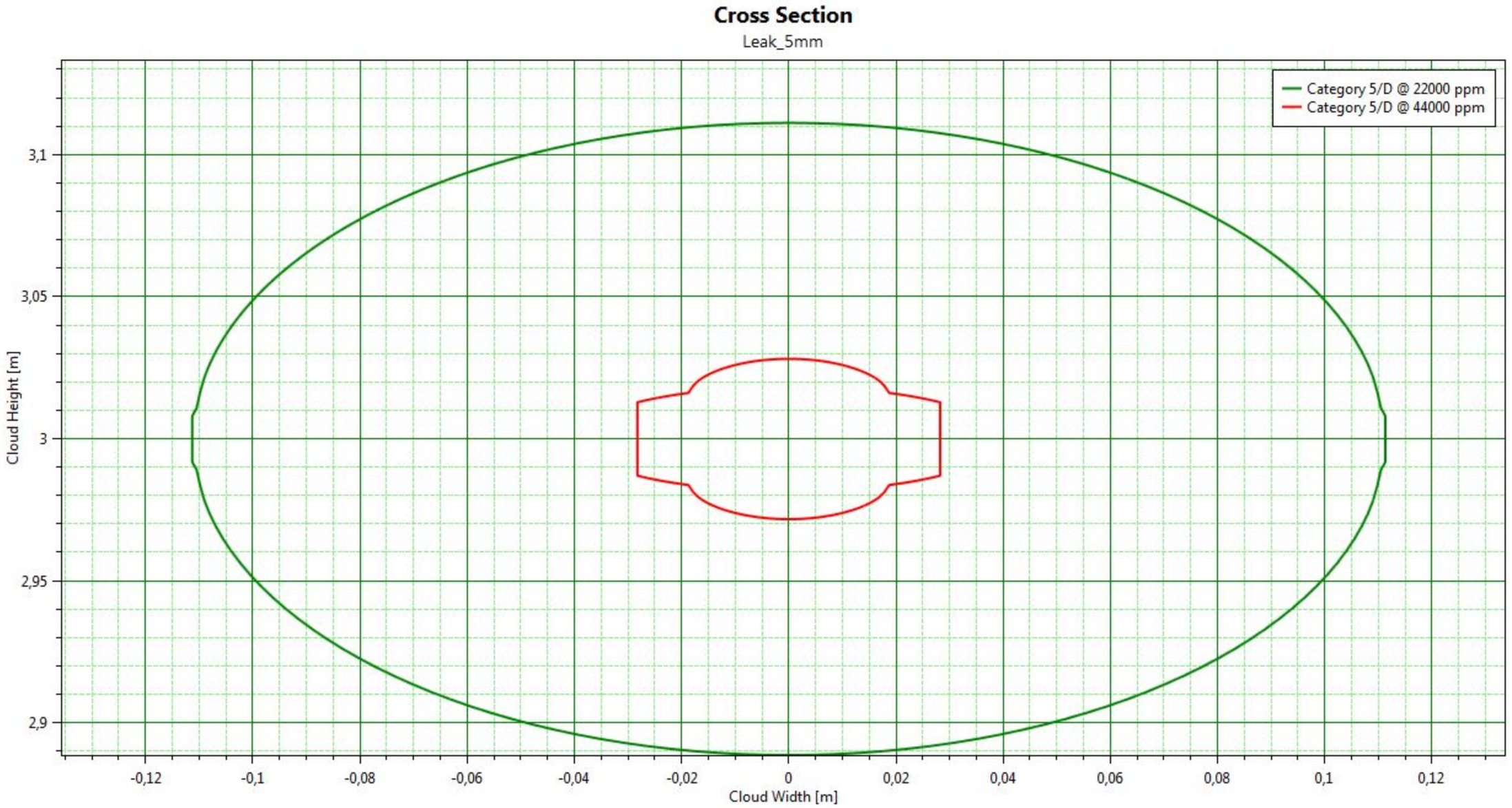
| | |
|---|---|
| Audit Number | 94428 |
| Averaging time | Flammable (18,75 s) |
| Equipment | pipe |
| Material | METHANE |
| Reference | METHANE |
| Offset Distance | 0 m |
| Program | Phast 7,21 |
| Scenario | Leak_5mm |
| Time | 2,97251 s |
| Weather | Category 2/F |
| Workspace | 17129I_LNG_rev00 |

| | |
|---|---|
| Audit Number | 94428 |
| Averaging time | Flammable (18,75 s) |
| Downwind Distance | 1,57164 m |
| Equipment | pipe |
| Material | METHANE |
| Reference | METHANE |
| Program | Phast 7,21 |
| Scenario | Leak_5mm |
| Time | 2,97251 s |
| Weather | Category 2/F |
| Workspace | 17129I_LNG_rev00 |



| | |
|---|---|
| Audit Number | 94428 |
| Averaging time | Flammable (18,75 s) |
| Equipment | pipe |
| Material | METHANE |
| Reference | METHANE |
| Offset Distance | 0 m |
| Program | Phast 7,21 |
| Scenario | Leak_5mm |
| Time | 2,97171 s |
| Weather | Category 5/D |
| Workspace | 17129I_LNG_rev00 |

| | |
|---|---|
| Audit Number | 94428 |
| Averaging time | Flammable (18,75 s) |
| Downwind Distance | 1,35369 m |
| Equipment | pipe |
| Material | METHANE |
| Reference | METHANE |
| Program | Phast 7,21 |
| Scenario | Leak_5mm |
| Time | 2,97171 s |
| Weather | Category 5/D |
| Workspace | 17129I_LNG_rev00 |



# Input Report

## Workspace: 17129I_LNG_rev00

### Top9_Pipe BOG

Study

17129I_LNG_rev00

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Context of calculations | Selection of context | Weathers to use for this study | Weather folder | |
| | | Parameters to use for this study | Parameter set | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| Toxic parameters | Indoor toxic calculations | Specify the downwind building type | Unselected | |
| | | Building type (downwind building type) | Buildings\Building type | |
| Dispersion | Distances of interest | Distances of interest | | m |

### pipe

Pressure vessel

17129I_LNG_rev00\Top9_Pipe BOG

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Material | Material | Material | METHANE | |
| | | Specify volume inventory? | No | |
| | | Mass inventory | 120 | kg |
| | | Volume inventory | 13,2237 | m3 |
| | | Material to track | METHANE | |
| | Phase | Specified condition | Pressure/temperature | |
| | | Temperature | -130 | degC |
| | | Pressure (gauge) | 5 | bar |
| | | Fluid state | Vapour | |
| | | Liquid mole fraction | 0 | fraction |

| | | Phase to be released | Vapour | |
|---|---|---|---|---|
| Scenario | Pipe dimensions | Pipe length | | m |
| | Release location | Elevation | 1 | m |
| | | Tank head | 0 | m |
| | | Release height from vessel bottom | | m |
| | Direction | Outdoor release direction | Horizontal | |
| | | Outdoor release angle | 0 | deg |
| Discharge parameters | Model settings | Atmospheric expansion method | Closest to initial conditions | |
| | | Is flashing allowed to the orifice? | Allow flashing in the orifice | |
| | Droplet break-up mechanism | Droplet break-up mechanism - instantaneous | Use flashing correlation | |
| | | Droplet break-up mechanism - continuous | Use flashing correlation | |
| Short pipe | Pipe characteristics | Pipe roughness | 0,0457 | mm |
| | Frequencies | Frequency of bends in pipe | 0 | /m |
| | | Frequency of couplings in pipe | 0 | /m |
| | | Frequency of junctions in pipe | 0 | /m |
| | Frequencies of valves | Frequency of excess flow valves | 0 | /m |
| | | Frequency of non-return valves | 0 | /m |
| | | Frequency of shut-off valves | 0 | /m |
| | Velocity head losses | Excess flow valve velocity head losses | 0 | |
| | | Non-return valve velocity head losses | 0 | |
| | | Shut-off valve velocity head losses | 0 | |
| Time varying releases | Modelling of time-varying leaks and line ruptures | Vacuum relief valve | Operating | |
| | | Vacuum relief valve set point | 0 | bar |
| | Dimensions | Tank shape | | |
| | | Tank height | | m |
| | | Tank width | | m |
| | | Tank length | | m |
| | | Tank diameter | | m |
| | Inventory data | Tank volume | 13,2237 | m3 |
| | | Tank vapour volume | 13,2237 | m3 |
| | | Tank liquid volume | 0 | m3 |

| | | | | |
|---|---|---|---|---|
| | | Tank liquid level | 0 | m |
| | | Maximum vapour release height | | m |
| | | Maximum mass inventory | 1E+09 | kg |
| Dispersion | Dispersion scope | Concentration of interest | 19390 | ppm |
| | | Averaging time for concentration of interest | Flammable | |
| | | Specify user-defined averaging time | No | |
| | | User defined averaging time | | s |
| | Distances of interest | Distances of interest | | m |
| | Averaging time for reports | ERPG [1 hr] | No | |
| | | IDLH [30 mins] | No | |
| | | STEL [15 mins] | No | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| | Building definition | Specify a release building | No | |
| | | Specified building (release building) | | |
| | | Building wake effect | None | |
| | | Wind or release angle from North | 0 | deg |
| | | Handling of droplets | Not trapped | |
| | | Indoor mass modification factor | 3 | |
| Explosion parameters | Explosion method (Consequence calculations only) | Explosion method | TNT | |
| | Ignition | Supply late ignition location | No ignition location | |
| | | Location of late ignition | | m |
| | Vapour liquid method | Use of explosion mass modification factor | Early and late explosions | |
| | | Explosion mass modification factor | 3 | |
| TNT | TNT parameters | Air or ground burst | Air burst | |
| | | Default TNT explosion efficiency | 0,1 | fraction |
| Fireball | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 3 | |

| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 4; 12,5; 37,5 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Mass modification factor | 3 | |
| | | Fireball maximum exposure duration | 20 | s |
| | Calculation method | Fireball model | Recommended | |
| | | TNO model flame temperature | 1726,85 | degC |
| Jet fire | Jet fire method | Jet fire method | Cone model | |
| | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Rate modification factor | 3 | |
| | | Jet fire maximum exposure duration | 20 | s |
| | Cone model data | Crosswind angle | 0 | deg |
| | | Horizontal options | Use standard method | |
| | | Correlation | Recommended | |
| | Surface emissive power | Calculation method for surface emissive power | Calculate SEP | |
| | | Flame emissive power | | kW/m2 |
| | | Emissivity fraction | | fraction |
| Pool fire | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |

| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Radiative fraction for general fires | 0,4 | fraction |
| | | Pool fire maximum exposure duration | 20 | s |
| Geometry | Geometry | East | 0 | m |
| | | North | 0 | m |

## Leak_25mm

Leak

17129I_LNG_rev00\Top9_Pipe BOG\pipe

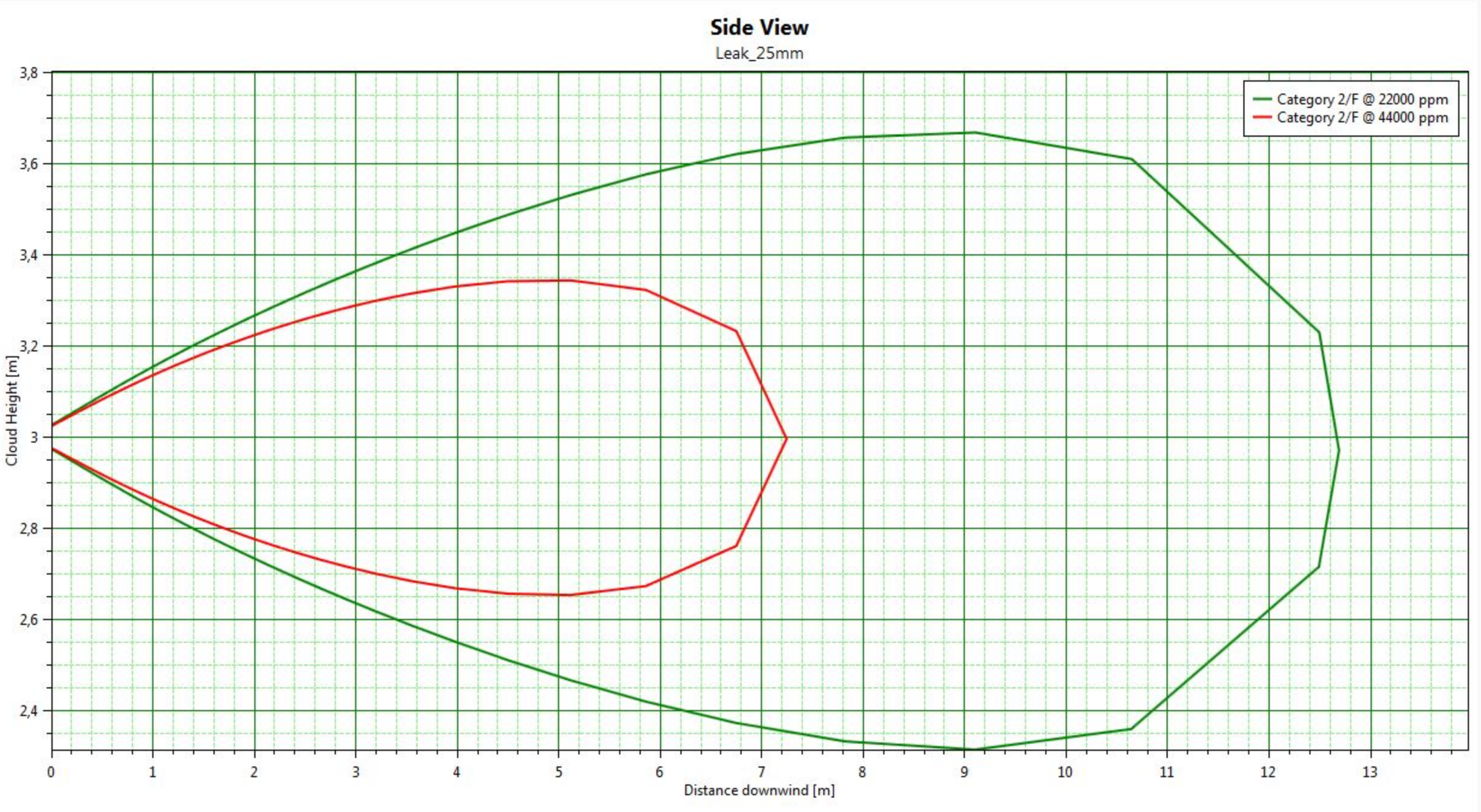
| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Scenario | Hole | Orifice diameter | 25 | mm |
| | | Use specified discharge coefficient? | No | |
| | | Discharge coefficient | | fraction |
| | Release location | Elevation | 3 | m |
| | | Tank head | 0 | m |
| | Direction | Outdoor release direction | Horizontal | |
| | | Outdoor release angle | 0 | deg |
| Material | Material | Material characteristics | Flammable only | |
| | | Material to track | METHANE | |
| | Phase | Phase to be released | Vapour | |
| Discharge parameters | Model settings | Atmospheric expansion method | Closest to initial conditions | |
| | | Is flashing allowed to the orifice? | Allow flashing in the orifice | |
| | Droplet break-up mechanism | Droplet break-up mechanism - continuous | Use flashing correlation | |
| Dispersion | Dispersion scope | Concentration of interest | 19390 | ppm |
| | | Averaging time for concentration of interest | Flammable | |
| | | Specify user-defined averaging time | No | |

| | | | | |
|---|---|---|---|---|
| | | User defined averaging time | | s |
| | Distances of interest | Distances of interest | | m |
| | Averaging time for reports | ERPG [1 hr] | No | |
| | | IDLH [30 mins] | No | |
| | | STEL [15 mins] | No | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| Toxic parameters | Indoor toxic calculations | Specify the downwind building type | Unselected | |
| | | Building type (downwind building type) | Buildings\Building type | |
| | Exposure time data | Set averaging time equal to exposure time | Use a fixed averaging time | |
| | | Cut-off fraction of toxic load for exposure time calculation | 0,05 | fraction |
| | | Cut-off concentration for exposure time calculations | 0 | fraction |
| | Toxic contours | Number of toxic levels | 4 | |
| | | Dose levels | 130000; 1,3E+06; 1,3E+07; 1,3E+08 | |
| | | Probit levels | 2; 3; 4; 10 | |
| | | Lethality levels | 0,001; 0,01; 0,1; 0,99 | fraction |
| Explosion parameters | Explosion method (Consequence calculations only) | Explosion method | TNT | |
| | Ignition | Supply late ignition location | No ignition location | |
| | | Location of late ignition | | m |
| | Vapour liquid method | Use of explosion mass modification factor | Early and late explosions | |
| | | Explosion mass modification factor | 3 | |
| TNT | TNT parameters | Air or ground burst | Air burst | |
| | | Default TNT explosion efficiency | 0,1 | fraction |
| Fireball | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 3 | |

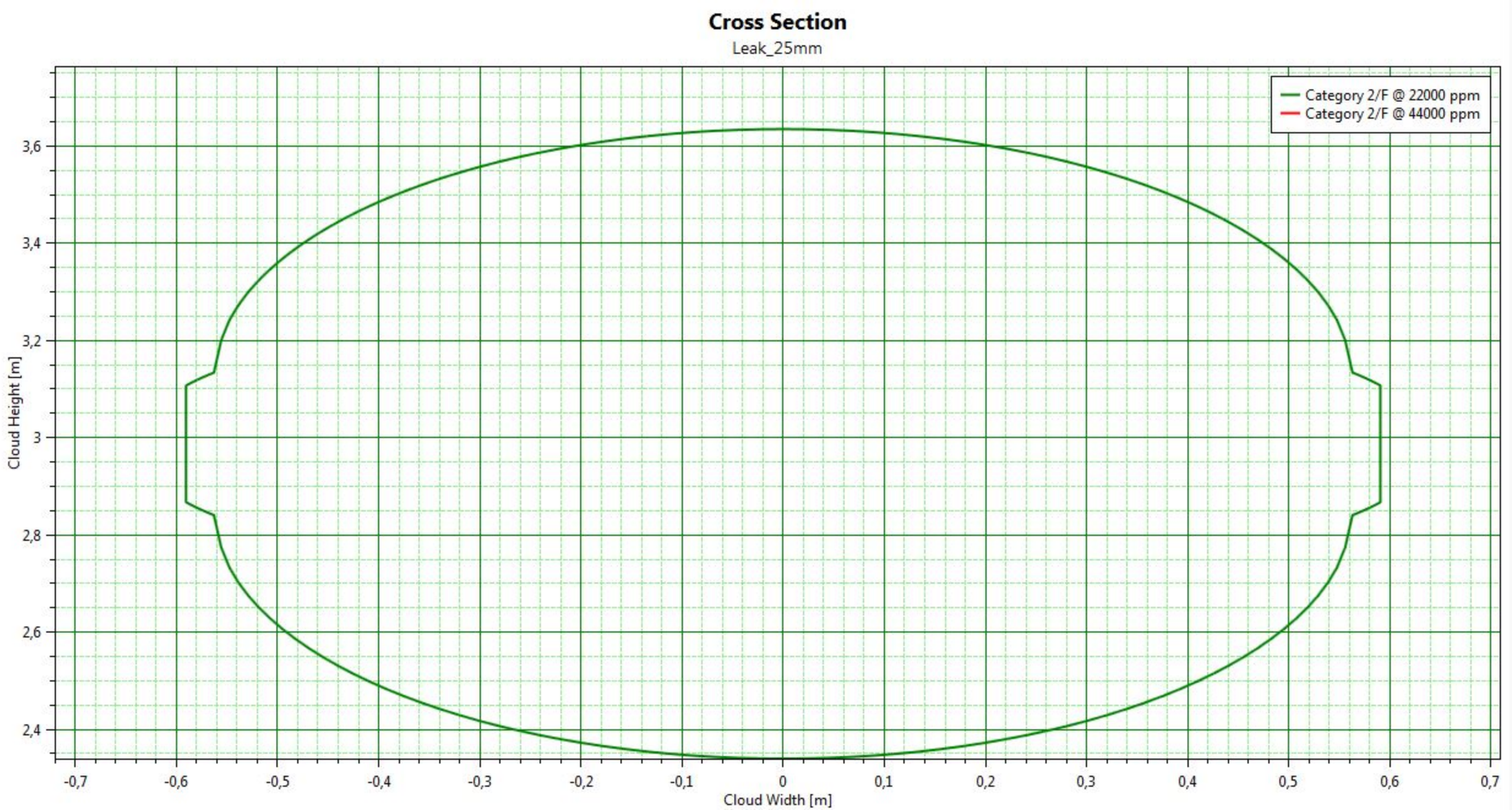
| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 4; 12,5; 37,5 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Mass modification factor | 3 | |
| | | Fireball maximum exposure duration | 20 | s |
| | Calculation method | Fireball model | Recommended | |
| | | TNO model flame temperature | 1726,85 | degC |
| Jet fire | Jet fire method | Jet fire method | Cone model | |
| | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Rate modification factor | 3 | |
| | | Jet fire maximum exposure duration | 20 | s |
| | Cone model data | Correlation | Recommended | |
| | | Horizontal options | Use standard method | |
| | Surface emissive power | Calculation method for surface emissive power | Calculate SEP | |
| | | Flame emissive power | | kW/m2 |
| | | Emissivity fraction | | fraction |
| Pool fire | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |

| | | | | |
|---|---|---|---|---|
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Radiative fraction for general fires | 0,4 | fraction |
| | | Pool fire maximum exposure duration | 20 | s |

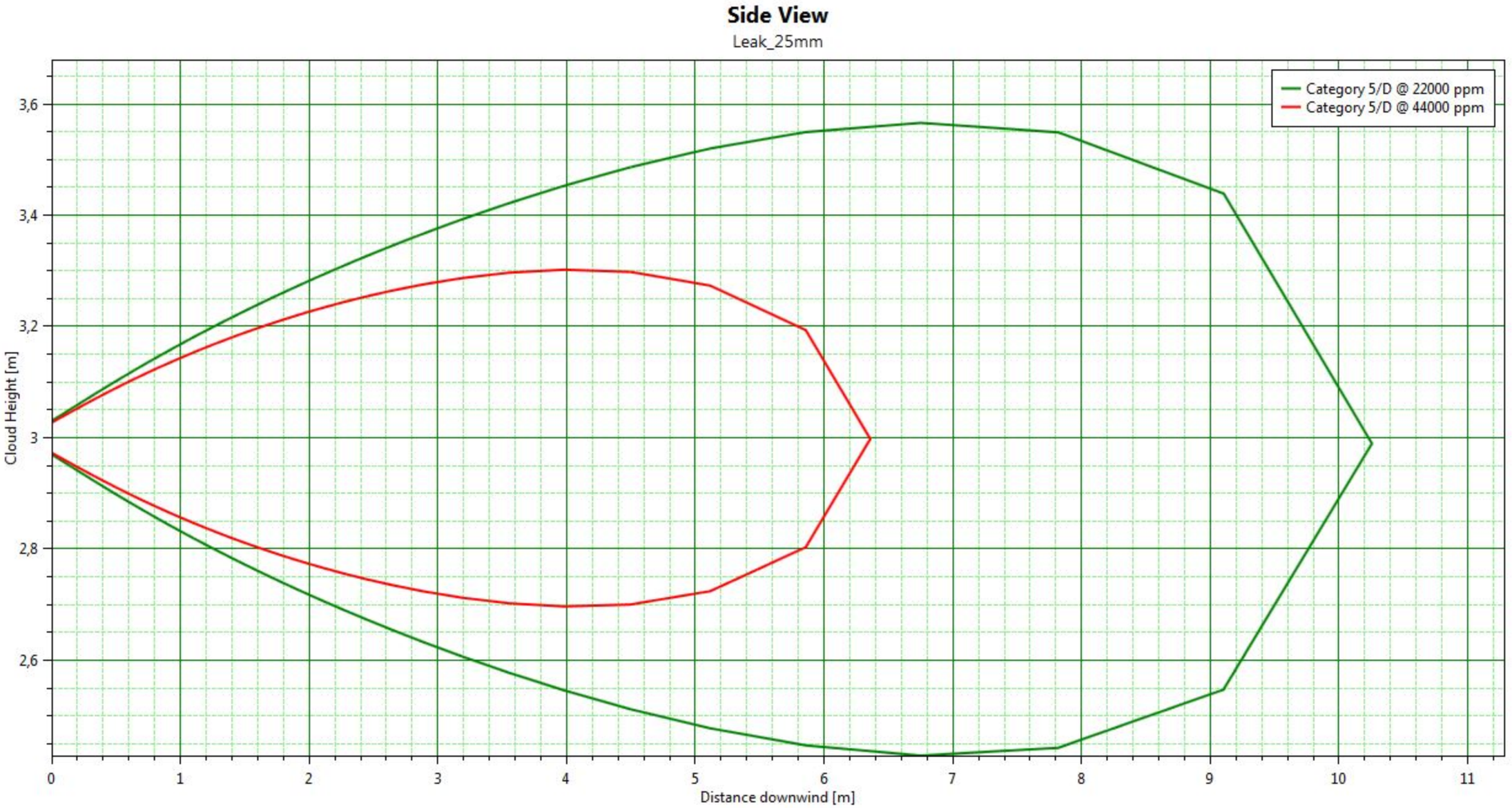
| | |
|---|---|
| Audit Number | 94428 |
| Averaging time | Flammable (18,75 s) |
| Equipment | pipe |
| Material | METHANE |
| Reference | METHANE |
| Offset Distance | 0 m |
| Program | Phast 7,21 |
| Scenario | Leak_25mm |
| Time | 2,90132 s |
| Weather | Category 2/F |
| Workspace | 17129I_LNG_rev00 |



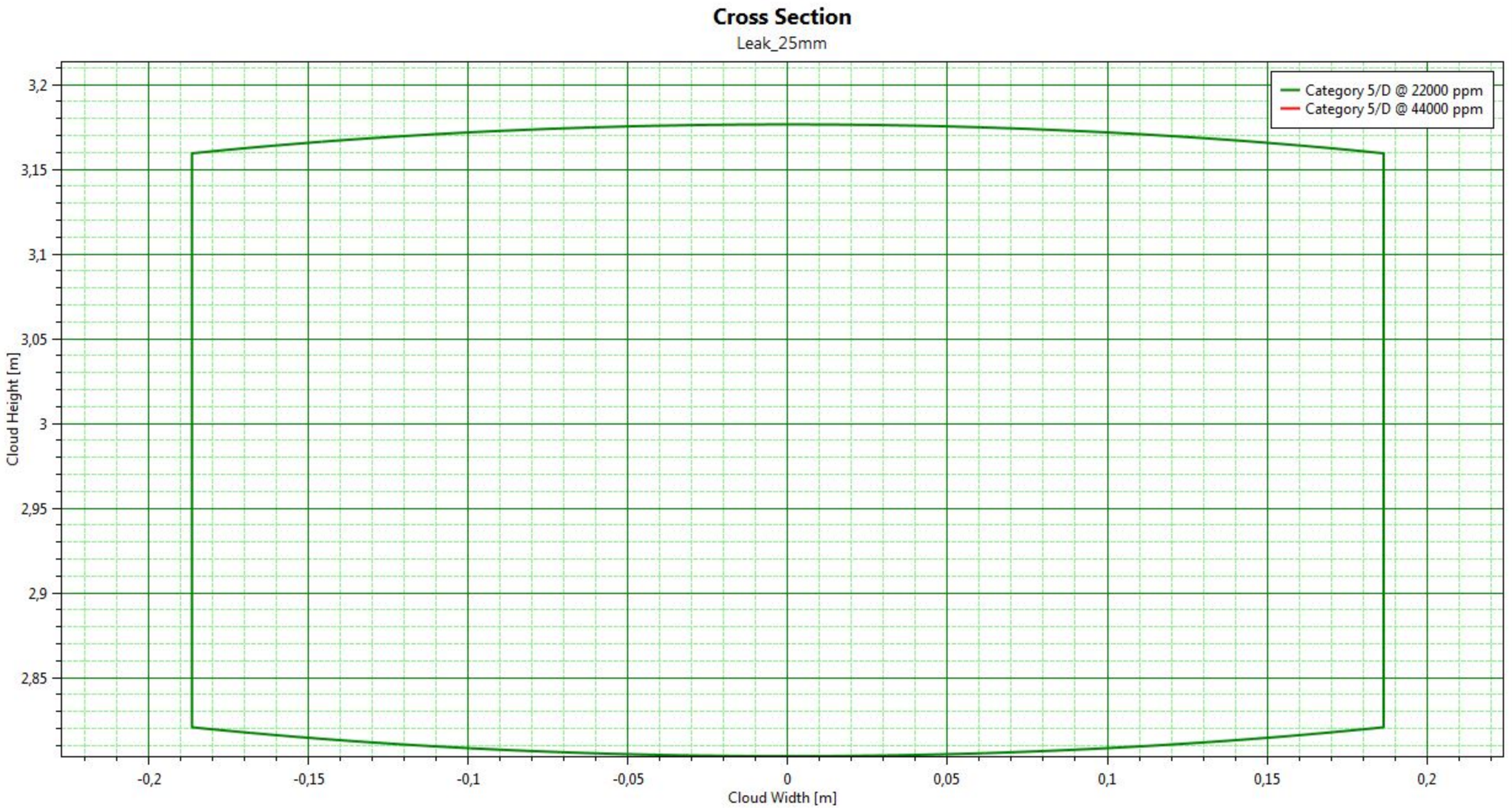
| | |
|---|---|
| Audit Number | 94428 |
| Averaging time | Flammable (18,75 s) |
| Downwind Distance | 10 m |
| Equipment | pipe |
| Material | METHANE |
| Reference | METHANE |
| Program | Phast 7,21 |
| Scenario | Leak_25mm |
| Time | 2,90132 s |
| Weather | Category 2/F |
| Workspace | 17129I_LNG_rev00 |



| | |
|---|---|
| Audit Number | 94428 |
| Averaging time | Flammable (18,75 s) |
| Equipment | pipe |
| Material | METHANE |
| Reference | METHANE |
| Offset Distance | 0 m |
| Program | Phast 7,21 |
| Scenario | Leak_25mm |
| Time | 2,89734 s |
| Weather | Category 5/D |
| Workspace | 17129I_LNG_rev00 |



| | |
|---|---|
| Audit Number | 94428 |
| Averaging time | Flammable (18,75 s) |
| Downwind Distance | 10 m |
| Equipment | pipe |
| Material | METHANE |
| Reference | METHANE |
| Program | Phast 7,21 |
| Scenario | Leak_25mm |
| Time | 2,89734 s |
| Weather | Category 5/D |
| Workspace | 17129I_LNG_rev00 |



# Input Report

## Workspace: 17129I_LNG_rev00

### Top10_Pipe evaporatore

Study

17129I_LNG_rev00

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Context of calculations | Selection of context | Weathers to use for this study | Weather folder | |
| | | Parameters to use for this study | Parameter set | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| Toxic parameters | Indoor toxic calculations | Specify the downwind building type | Unselected | |
| | | Building type (downwind building type) | Buildings\Building type | |
| Dispersion | Distances of interest | Distances of interest | | m |

### pipe_70bar

Pressure vessel

17129I_LNG_rev00\Top10_Pipe evaporatore

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Material | Material | Material | METHANE | |
| | | Specify volume inventory? | No | |
| | | Mass inventory | 2556 | kg |
| | | Volume inventory | 6,31314 | m3 |
| | | Material to track | METHANE | |
| | Phase | Specified condition | Pressure/temperature | |
| | | Temperature | -150 | degC |
| | | Pressure (gauge) | 70 | bar |
| | | Fluid state | Liquid | |
| | | Liquid mole fraction | 1 | fraction |

| | | Phase to be released | Liquid | |
|---|---|---|---|---|
| Scenario | Pipe dimensions | Pipe length | | m |
| | Release location | Elevation | 6 | m |
| | | Tank head | 0 | m |
| | | Release height from vessel bottom | | m |
| | Direction | Outdoor release direction | Horizontal | |
| | | Outdoor release angle | 0 | deg |
| Discharge parameters | Model settings | Atmospheric expansion method | Closest to initial conditions | |
| | | Is flashing allowed to the orifice? | Allow flashing in the orifice | |
| | Droplet break-up mechanism | Droplet break-up mechanism - instantaneous | Use flashing correlation | |
| | | Droplet break-up mechanism - continuous | Use flashing correlation | |
| Short pipe | Pipe characteristics | Pipe roughness | 0,0457 | mm |
| | Frequencies | Frequency of bends in pipe | 0 | /m |
| | | Frequency of couplings in pipe | 0 | /m |
| | | Frequency of junctions in pipe | 0 | /m |
| | Frequencies of valves | Frequency of excess flow valves | 0 | /m |
| | | Frequency of non-return valves | 0 | /m |
| | | Frequency of shut-off valves | 0 | /m |
| | Velocity head losses | Excess flow valve velocity head losses | 0 | |
| | | Non-return valve velocity head losses | 0 | |
| | | Shut-off valve velocity head losses | 0 | |
| Time varying releases | Modelling of time-varying leaks and line ruptures | Vacuum relief valve | Operating | |
| | | Vacuum relief valve set point | 0 | bar |
| | Dimensions | Tank shape | | |
| | | Tank height | | m |
| | | Tank width | | m |
| | | Tank length | | m |
| | | Tank diameter | | m |
| | Inventory data | Tank volume | 6,31314 | m3 |
| | | Tank vapour volume | 0 | m3 |
| | | Tank liquid volume | 6,31314 | m3 |

| | | | | |
|---|---|---|---|---|
| | | Tank liquid level | 0 | m |
| | | Maximum vapour release height | | m |
| | | Maximum mass inventory | 1E+09 | kg |
| Dispersion | Dispersion scope | Concentration of interest | 19390 | ppm |
| | | Averaging time for concentration of interest | Flammable | |
| | | Specify user-defined averaging time | No | |
| | | User defined averaging time | | s |
| | Distances of interest | Distances of interest | | m |
| | Averaging time for reports | ERPG [1 hr] | No | |
| | | IDLH [30 mins] | No | |
| | | STEL [15 mins] | No | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| | Building definition | Specify a release building | No | |
| | | Specified building (release building) | | |
| | | Building wake effect | None | |
| | | Wind or release angle from North | 0 | deg |
| | | Handling of droplets | Not trapped | |
| | | Indoor mass modification factor | 3 | |
| Explosion parameters | Explosion method (Consequence calculations only) | Explosion method | TNT | |
| | Ignition | Supply late ignition location | No ignition location | |
| | | Location of late ignition | | m |
| | Vapour liquid method | Use of explosion mass modification factor | Early and late explosions | |
| | | Explosion mass modification factor | 3 | |
| TNT | TNT parameters | Air or ground burst | Air burst | |
| | | Default TNT explosion efficiency | 0,1 | fraction |
| Fireball | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 3 | |

| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 4; 12,5; 37,5 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Mass modification factor | 3 | |
| | | Fireball maximum exposure duration | 20 | s |
| | Calculation method | Fireball model | Recommended | |
| | | TNO model flame temperature | 1726,85 | degC |
| Jet fire | Jet fire method | Jet fire method | Cone model | |
| | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Rate modification factor | 3 | |
| | | Jet fire maximum exposure duration | 20 | s |
| | Cone model data | Crosswind angle | 0 | deg |
| | | Horizontal options | Use standard method | |
| | | Correlation | Recommended | |
| | Surface emissive power | Calculation method for surface emissive power | Calculate SEP | |
| | | Flame emissive power | | kW/m2 |
| | | Emissivity fraction | | fraction |
| Pool fire | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |

| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Radiative fraction for general fires | 0,4 | fraction |
| | | Pool fire maximum exposure duration | 20 | s |
| Geometry | Geometry | East | 0 | m |
| | | North | 0 | m |

## Leak_2mm

Leak

17129I_LNG_rev00\Top10_Pipe evaporatore\pipe_70bar

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Scenario | Hole | Orifice diameter | 2 | mm |
| | | Use specified discharge coefficient? | No | |
| | | Discharge coefficient | | fraction |
| | Release location | Elevation | 1 | m |
| | | Tank head | 0 | m |
| | Direction | Outdoor release direction | Horizontal | |
| | | Outdoor release angle | 0 | deg |
| Material | Material | Material characteristics | Flammable only | |
| | | Material to track | METHANE | |
| | Phase | Phase to be released | Liquid | |
| Discharge parameters | Model settings | Atmospheric expansion method | Closest to initial conditions | |
| | | Is flashing allowed to the orifice? | Allow flashing in the orifice | |
| | Droplet break-up mechanism | Droplet break-up mechanism - continuous | Use flashing correlation | |
| Dispersion | Dispersion scope | Concentration of interest | 19390 | ppm |
| | | Averaging time for concentration of interest | Flammable | |
| | | Specify user-defined averaging time | No | |

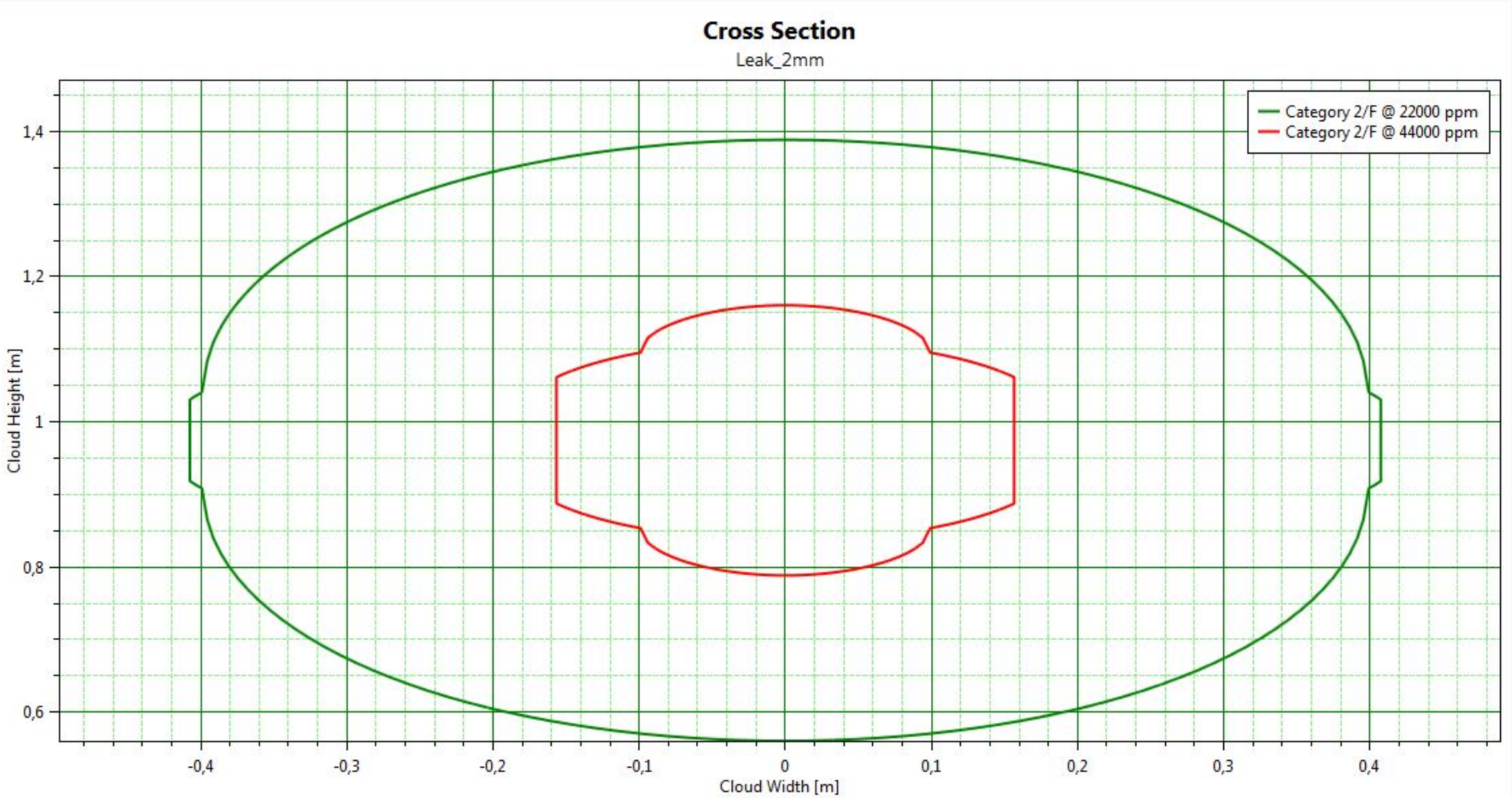
| | | | | |
|---|---|---|---|---|
| | | User defined averaging time | | s |
| | Distances of interest | Distances of interest | | m |
| | Averaging time for reports | ERPG [1 hr] | No | |
| | | IDLH [30 mins] | No | |
| | | STEL [15 mins] | No | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| Toxic parameters | Indoor toxic calculations | Specify the downwind building type | Unselected | |
| | | Building type (downwind building type) | Buildings\Building type | |
| | Exposure time data | Set averaging time equal to exposure time | Use a fixed averaging time | |
| | | Cut-off fraction of toxic load for exposure time calculation | 0,05 | fraction |
| | | Cut-off concentration for exposure time calculations | 0 | fraction |
| | Toxic contours | Number of toxic levels | 4 | |
| | | Dose levels | 130000; 1,3E+06; 1,3E+07; 1,3E+08 | |
| | | Probit levels | 2; 3; 4; 10 | |
| | | Lethality levels | 0,001; 0,01; 0,1; 0,99 | fraction |
| Explosion parameters | Explosion method (Consequence calculations only) | Explosion method | TNT | |
| | Ignition | Supply late ignition location | No ignition location | |
| | | Location of late ignition | | m |
| | Vapour liquid method | Use of explosion mass modification factor | Early and late explosions | |
| | | Explosion mass modification factor | 3 | |
| Fireball | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 3 | |
| | | Intensity levels | 4; 12,5; 37,5 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |

| | | | | |
|---|---|---|---|---|
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Mass modification factor | 3 | |
| | | Fireball maximum exposure duration | 20 | s |
| | Calculation method | Fireball model | Recommended | |
| | | TNO model flame temperature | 1726,85 | degC |
| Jet fire | Jet fire method | Jet fire method | Cone model | |
| | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Rate modification factor | 3 | |
| | | Jet fire maximum exposure duration | 20 | s |
| | Cone model data | Correlation | Recommended | |
| | | Horizontal options | Use standard method | |
| | Surface emissive power | Calculation method for surface emissive power | Calculate SEP | |
| | | Flame emissive power | | kW/m2 |
| | | Emissivity fraction | | fraction |
| Pool fire | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |

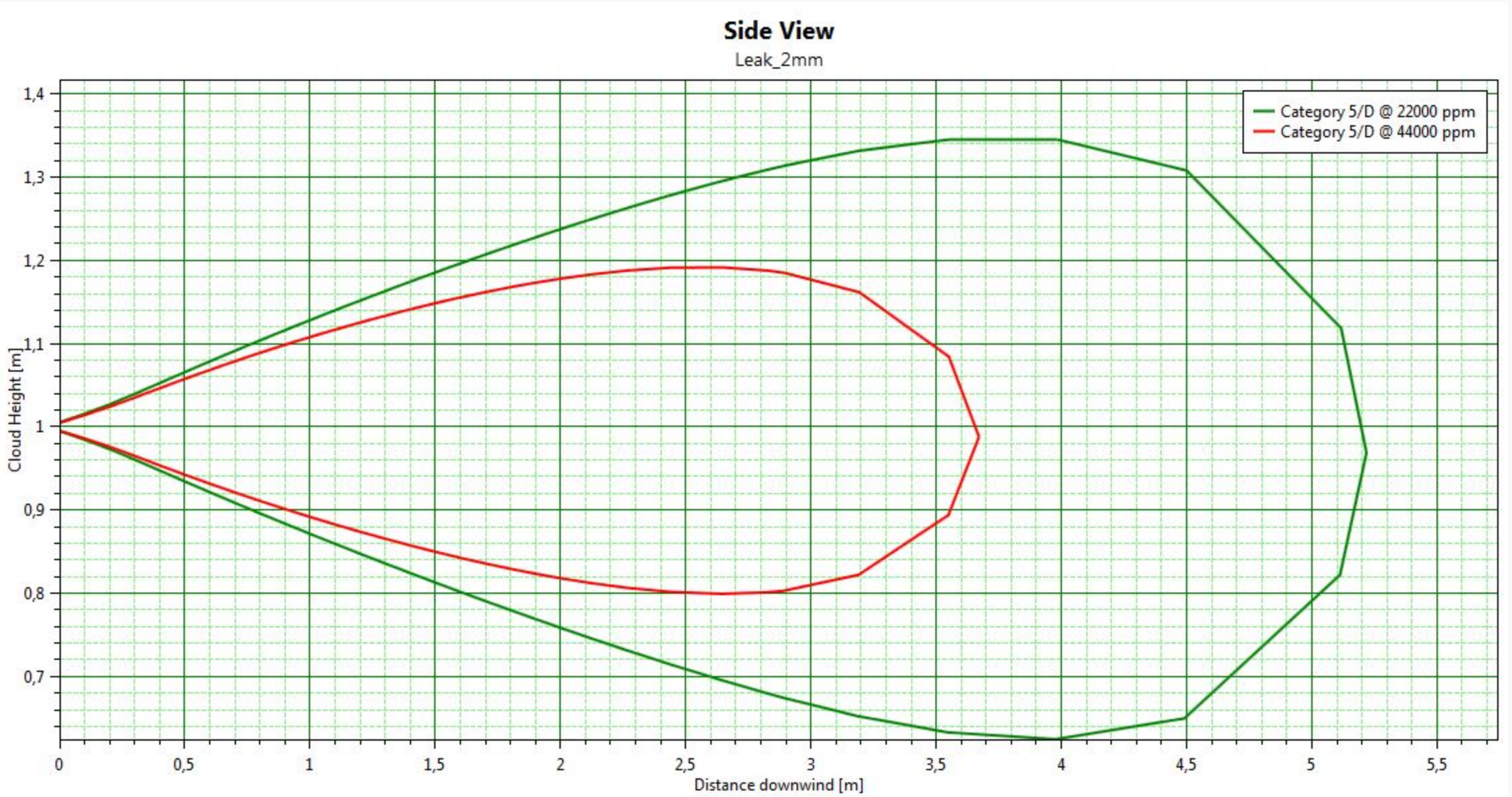
| | | | | |
|---|---|---|---|---|
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Radiative fraction for general fires | 0,4 | fraction |
| | | Pool fire maximum exposure duration | 20 | s |

| | |
|---|---|
| Audit Number | 94612 |
| Averaging time | Flammable (18,75 s) |
| Equipment | pipe_70bar |
| Material | METHANE |
| Reference | METHANE |
| Offset Distance | 0 m |
| Program | Phast 7,21 |
| Scenario | Leak_2mm |
| Time | 110,126 s |
| Weather | Category 2/F |
| Workspace | 17129I_LNG_rev00 |

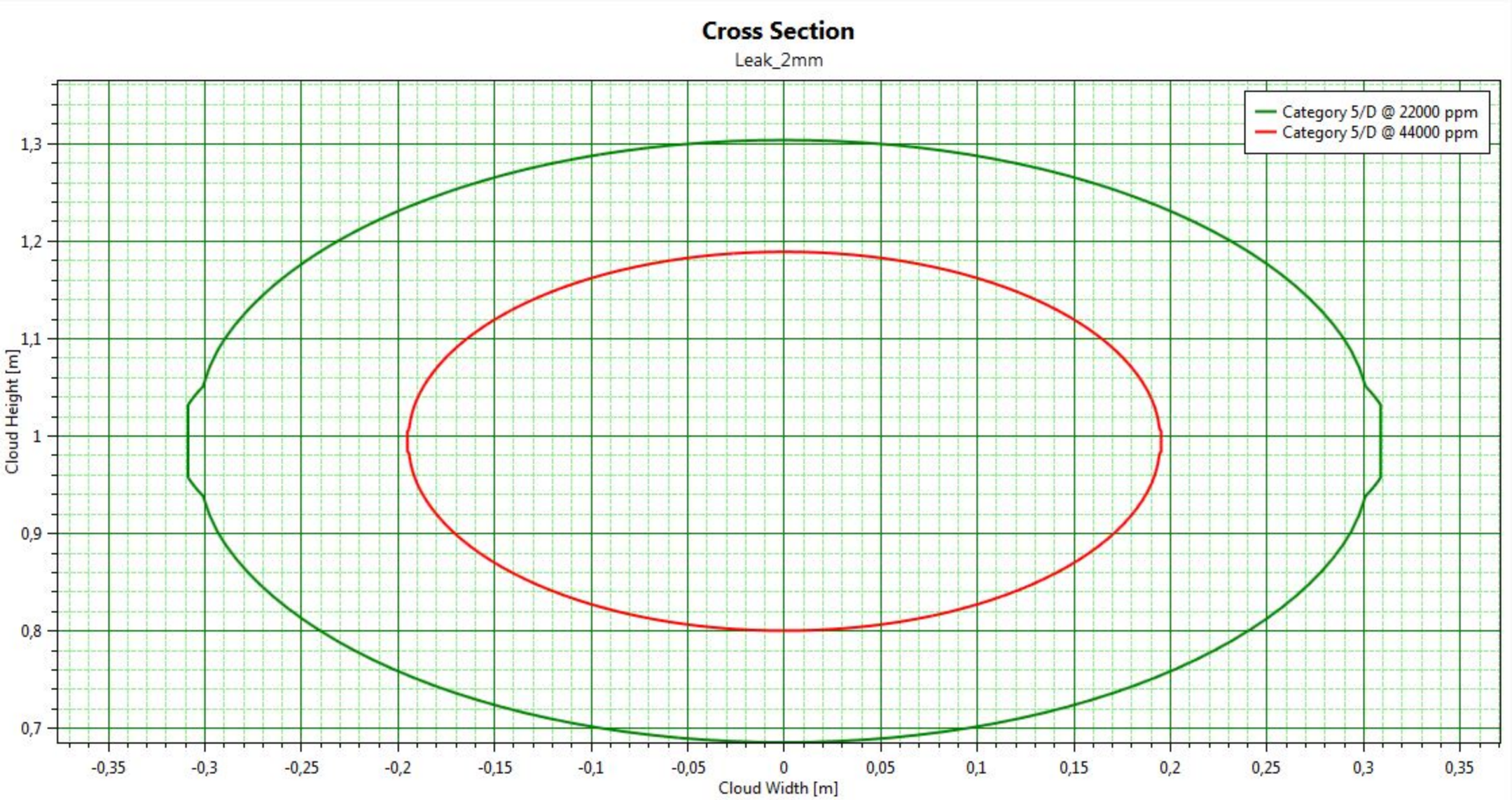
| | |
|---|---|
| Audit Number | 94612 |
| Averaging time | Flammable (18,75 s) |
| Downwind Distance | 4,17228 m |
| Equipment | pipe_70bar |
| Material | METHANE |
| Reference | METHANE |
| Program | Phast 7,21 |
| Scenario | Leak_2mm |
| Time (Category 2/F) | 1,16219 s |
| Weather | Category 2/F |
| Workspace | 17129I_LNG_rev00 |



| | |
|---|---|
| Audit Number | 94612 |
| Averaging time | Flammable (18,75 s) |
| Equipment | pipe_70bar |
| Material | METHANE |
| Reference | METHANE |
| Offset Distance | 0 m |
| Program | Phast 7,21 |
| Scenario | Leak_2mm |
| Time (Category 5/D) | 0,484846 s |
| Weather | Category 5/D |
| Workspace | 17129I_LNG_rev00 |



| | |
|---|---|
| Audit Number | 94612 |
| Averaging time | Flammable (18,75 s) |
| Downwind Distance | 2,75648 m |
| Equipment | pipe_70bar |
| Material | METHANE |
| Reference | METHANE |
| Program | Phast 7,21 |
| Scenario | Leak_2mm |
| Time (Category 5/D) | 0,484846 s |
| Weather | Category 5/D |
| Workspace | 17129I_LNG_rev00 |



# Input Report

## Workspace: 17129I_LNG_rev00

### Top10_Pipe evaporatore

Study

17129I_LNG_rev00

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Context of calculations | Selection of context | Weathers to use for this study | Weather folder | |
| | | Parameters to use for this study | Parameter set | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| Toxic parameters | Indoor toxic calculations | Specify the downwind building type | Unselected | |
| | | Building type (downwind building type) | Buildings\Building type | |
| Dispersion | Distances of interest | Distances of interest | | m |

### pipe_70bar

Pressure vessel

17129I_LNG_rev00\Top10_Pipe evaporatore

| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Material | Material | Material | METHANE | |
| | | Specify volume inventory? | No | |
| | | Mass inventory | 2556 | kg |
| | | Volume inventory | 6,31314 | m3 |
| | | Material to track | METHANE | |
| | Phase | Specified condition | Pressure/temperature | |
| | | Temperature | -150 | degC |
| | | Pressure (gauge) | 70 | bar |
| | | Fluid state | Liquid | |
| | | Liquid mole fraction | 1 | fraction |

| | | Phase to be released | Liquid | |
|---|---|---|---|---|
| Scenario | Pipe dimensions | Pipe length | | m |
| | Release location | Elevation | 6 | m |
| | | Tank head | 0 | m |
| | | Release height from vessel bottom | | m |
| | Direction | Outdoor release direction | Horizontal | |
| | | Outdoor release angle | 0 | deg |
| Discharge parameters | Model settings | Atmospheric expansion method | Closest to initial conditions | |
| | | Is flashing allowed to the orifice? | Allow flashing in the orifice | |
| | Droplet break-up mechanism | Droplet break-up mechanism - instantaneous | Use flashing correlation | |
| | | Droplet break-up mechanism - continuous | Use flashing correlation | |
| Short pipe | Pipe characteristics | Pipe roughness | 0,0457 | mm |
| | Frequencies | Frequency of bends in pipe | 0 | /m |
| | | Frequency of couplings in pipe | 0 | /m |
| | | Frequency of junctions in pipe | 0 | /m |
| | Frequencies of valves | Frequency of excess flow valves | 0 | /m |
| | | Frequency of non-return valves | 0 | /m |
| | | Frequency of shut-off valves | 0 | /m |
| | Velocity head losses | Excess flow valve velocity head losses | 0 | |
| | | Non-return valve velocity head losses | 0 | |
| | | Shut-off valve velocity head losses | 0 | |
| Time varying releases | Modelling of time-varying leaks and line ruptures | Vacuum relief valve | Operating | |
| | | Vacuum relief valve set point | 0 | bar |
| | Dimensions | Tank shape | | |
| | | Tank height | | m |
| | | Tank width | | m |
| | | Tank length | | m |
| | | Tank diameter | | m |
| | Inventory data | Tank volume | 6,31314 | m3 |
| | | Tank vapour volume | 0 | m3 |
| | | Tank liquid volume | 6,31314 | m3 |

| | | | | |
|---|---|---|---|---|
| | | Tank liquid level | 0 | m |
| | | Maximum vapour release height | | m |
| | | Maximum mass inventory | 1E+09 | kg |
| Dispersion | Dispersion scope | Concentration of interest | 19390 | ppm |
| | | Averaging time for concentration of interest | Flammable | |
| | | Specify user-defined averaging time | No | |
| | | User defined averaging time | | s |
| | Distances of interest | Distances of interest | | m |
| | Averaging time for reports | ERPG [1 hr] | No | |
| | | IDLH [30 mins] | No | |
| | | STEL [15 mins] | No | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| | Building definition | Specify a release building | No | |
| | | Specified building (release building) | | |
| | | Building wake effect | None | |
| | | Wind or release angle from North | 0 | deg |
| | | Handling of droplets | Not trapped | |
| | | Indoor mass modification factor | 3 | |
| Explosion parameters | Explosion method (Consequence calculations only) | Explosion method | TNT | |
| | Ignition | Supply late ignition location | No ignition location | |
| | | Location of late ignition | | m |
| | Vapour liquid method | Use of explosion mass modification factor | Early and late explosions | |
| | | Explosion mass modification factor | 3 | |
| TNT | TNT parameters | Air or ground burst | Air burst | |
| | | Default TNT explosion efficiency | 0,1 | fraction |
| Fireball | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 3 | |

| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 4; 12,5; 37,5 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Mass modification factor | 3 | |
| | | Fireball maximum exposure duration | 20 | s |
| | Calculation method | Fireball model | Recommended | |
| | | TNO model flame temperature | 1726,85 | degC |
| Jet fire | Jet fire method | Jet fire method | Cone model | |
| | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Rate modification factor | 3 | |
| | | Jet fire maximum exposure duration | 20 | s |
| | Cone model data | Crosswind angle | 0 | deg |
| | | Horizontal options | Use standard method | |
| | | Correlation | Recommended | |
| | Surface emissive power | Calculation method for surface emissive power | Calculate SEP | |
| | | Flame emissive power | | kW/m2 |
| | | Emissivity fraction | | fraction |
| Pool fire | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |

| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Radiative fraction for general fires | 0,4 | fraction |
| | | Pool fire maximum exposure duration | 20 | s |
| Geometry | Geometry | East | 0 | m |
| | | North | 0 | m |

## Leak_5mm

Leak

17129I_LNG_rev00\Top10_Pipe evaporatore\pipe_70bar

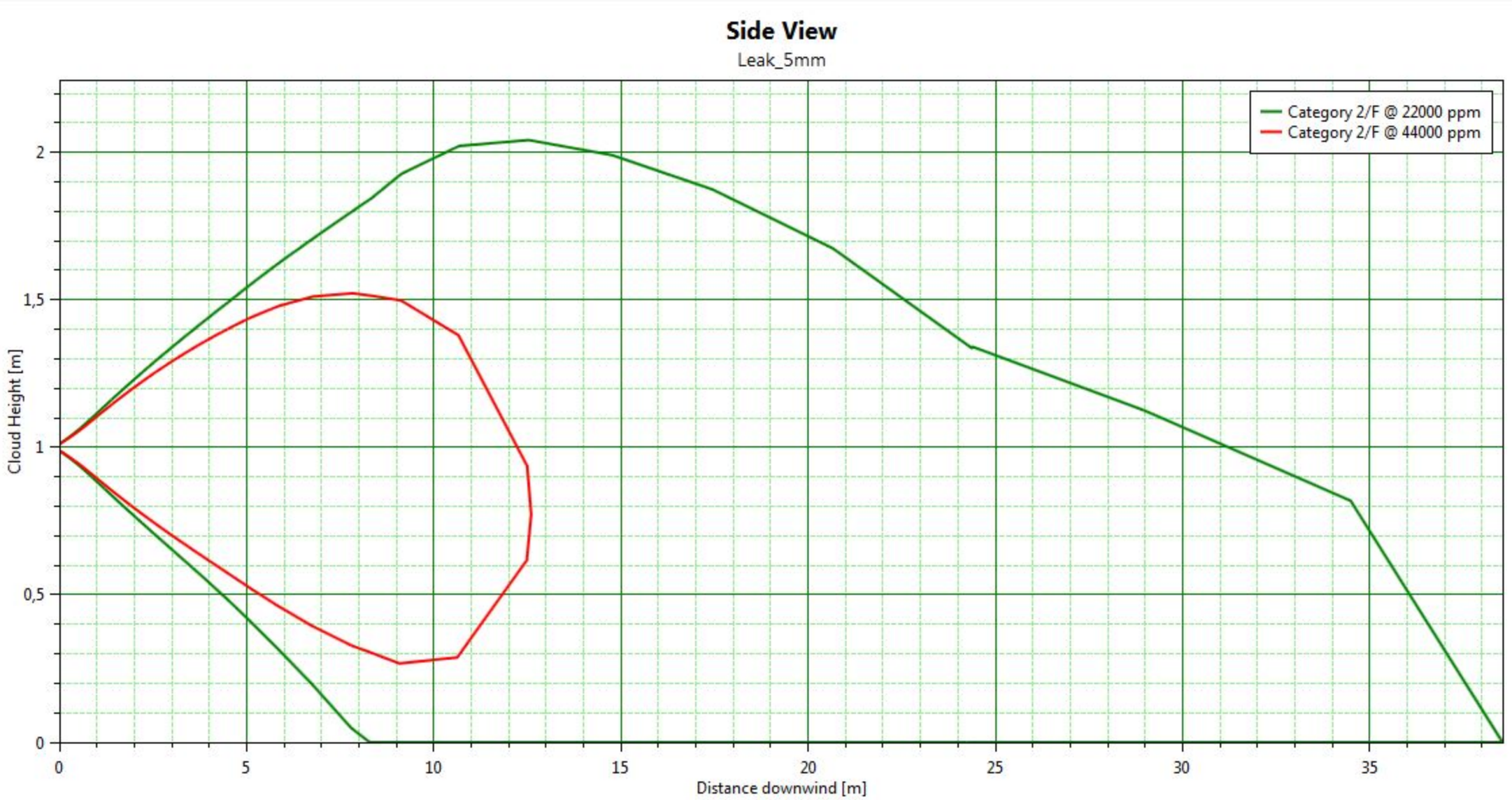
| Tab | Group | Field | Value | Units |
|---|---|---|---|---|
| Scenario | Hole | Orifice diameter | 5 | mm |
| | | Use specified discharge coefficient? | No | |
| | | Discharge coefficient | | fraction |
| | Release location | Elevation | 1 | m |
| | | Tank head | 0 | m |
| | Direction | Outdoor release direction | Horizontal | |
| | | Outdoor release angle | 0 | deg |
| Material | Material | Material characteristics | Flammable only | |
| | | Material to track | METHANE | |
| | Phase | Phase to be released | Liquid | |
| Discharge parameters | Model settings | Atmospheric expansion method | Closest to initial conditions | |
| | | Is flashing allowed to the orifice? | Allow flashing in the orifice | |
| | Droplet break-up mechanism | Droplet break-up mechanism - continuous | Use flashing correlation | |
| Dispersion | Dispersion scope | Concentration of interest | 19390 | ppm |
| | | Averaging time for concentration of interest | Flammable | |
| | | Specify user-defined averaging time | No | |

| | | | | |
|---|---|---|---|---|
| | | User defined averaging time | | s |
| | Distances of interest | Distances of interest | | m |
| | Averaging time for reports | ERPG [1 hr] | No | |
| | | IDLH [30 mins] | No | |
| | | STEL [15 mins] | No | |
| Bund, building and terrain | Terrain definition | Type of terrain for dispersion turbulence | Terrain types\Default terrain | |
| | Bund definition | Bund and type of surface for pools | Bund types\No bund | |
| Toxic parameters | Indoor toxic calculations | Specify the downwind building type | Unselected | |
| | | Building type (downwind building type) | Buildings\Building type | |
| | Exposure time data | Set averaging time equal to exposure time | Use a fixed averaging time | |
| | | Cut-off fraction of toxic load for exposure time calculation | 0,05 | fraction |
| | | Cut-off concentration for exposure time calculations | 0 | fraction |
| | Toxic contours | Number of toxic levels | 4 | |
| | | Dose levels | 130000; 1,3E+06; 1,3E+07; 1,3E+08 | |
| | | Probit levels | 2; 3; 4; 10 | |
| | | Lethality levels | 0,001; 0,01; 0,1; 0,99 | fraction |
| Explosion parameters | Explosion method (Consequence calculations only) | Explosion method | TNT | |
| | Ignition | Supply late ignition location | No ignition location | |
| | | Location of late ignition | | m |
| | Vapour liquid method | Use of explosion mass modification factor | Early and late explosions | |
| | | Explosion mass modification factor | 3 | |
| TNT | TNT parameters | Air or ground burst | Air burst | |
| | | Default TNT explosion efficiency | 0,1 | fraction |
| Fireball | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 3 | |

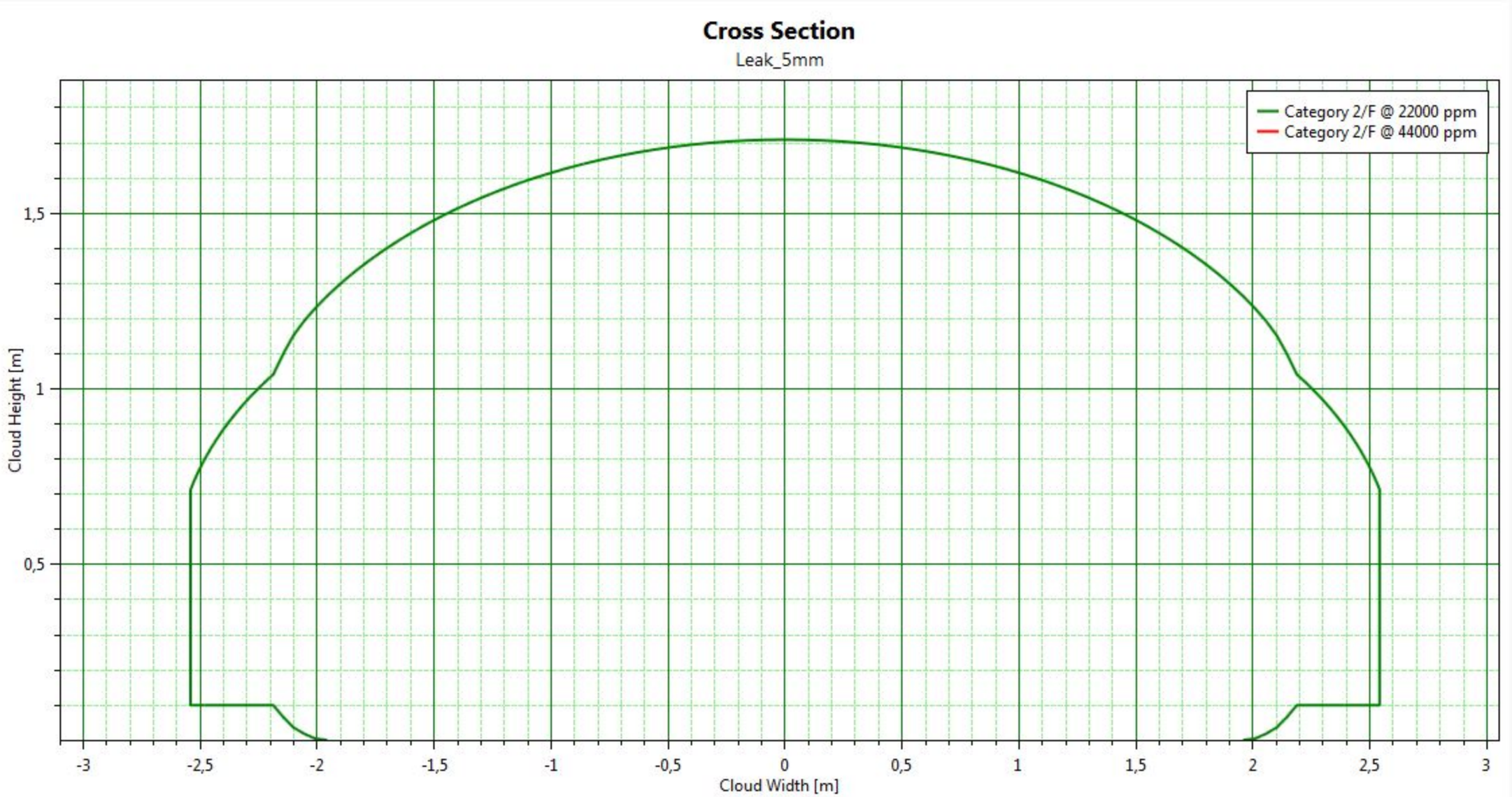
| | | | | |
|---|---|---|---|---|
| | | Intensity levels | 4; 12,5; 37,5 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Mass modification factor | 3 | |
| | | Fireball maximum exposure duration | 20 | s |
| | Calculation method | Fireball model | Recommended | |
| | | TNO model flame temperature | 1726,85 | degC |
| Jet fire | Jet fire method | Jet fire method | Cone model | |
| | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Rate modification factor | 3 | |
| | | Jet fire maximum exposure duration | 20 | s |
| | Cone model data | Correlation | Recommended | |
| | | Horizontal options | Use standard method | |
| | Surface emissive power | Calculation method for surface emissive power | Calculate SEP | |
| | | Flame emissive power | | kW/m2 |
| | | Emissivity fraction | | fraction |
| Pool fire | Result types to calculate | Calculate probit | No | |
| | | Calculate dose | No | |
| | | Calculate lethality | No | |
| | Radiation levels | Number of input radiation levels | 5 | |
| | | Intensity levels | 5; 12,5; 37,5; 7; 3 | kW/m2 |

| | | | | |
|---|---|---|---|---|
| | | Probit levels | 2,73; 3,72; 7,5 | |
| | | Dose levels | 1,27E+06; 5,8E+06; 2,51E+07 | |
| | | Lethality levels | 0,01; 0,1; 0,99 | fraction |
| | Parameters | Radiative fraction for general fires | 0,4 | fraction |
| | | Pool fire maximum exposure duration | 20 | s |

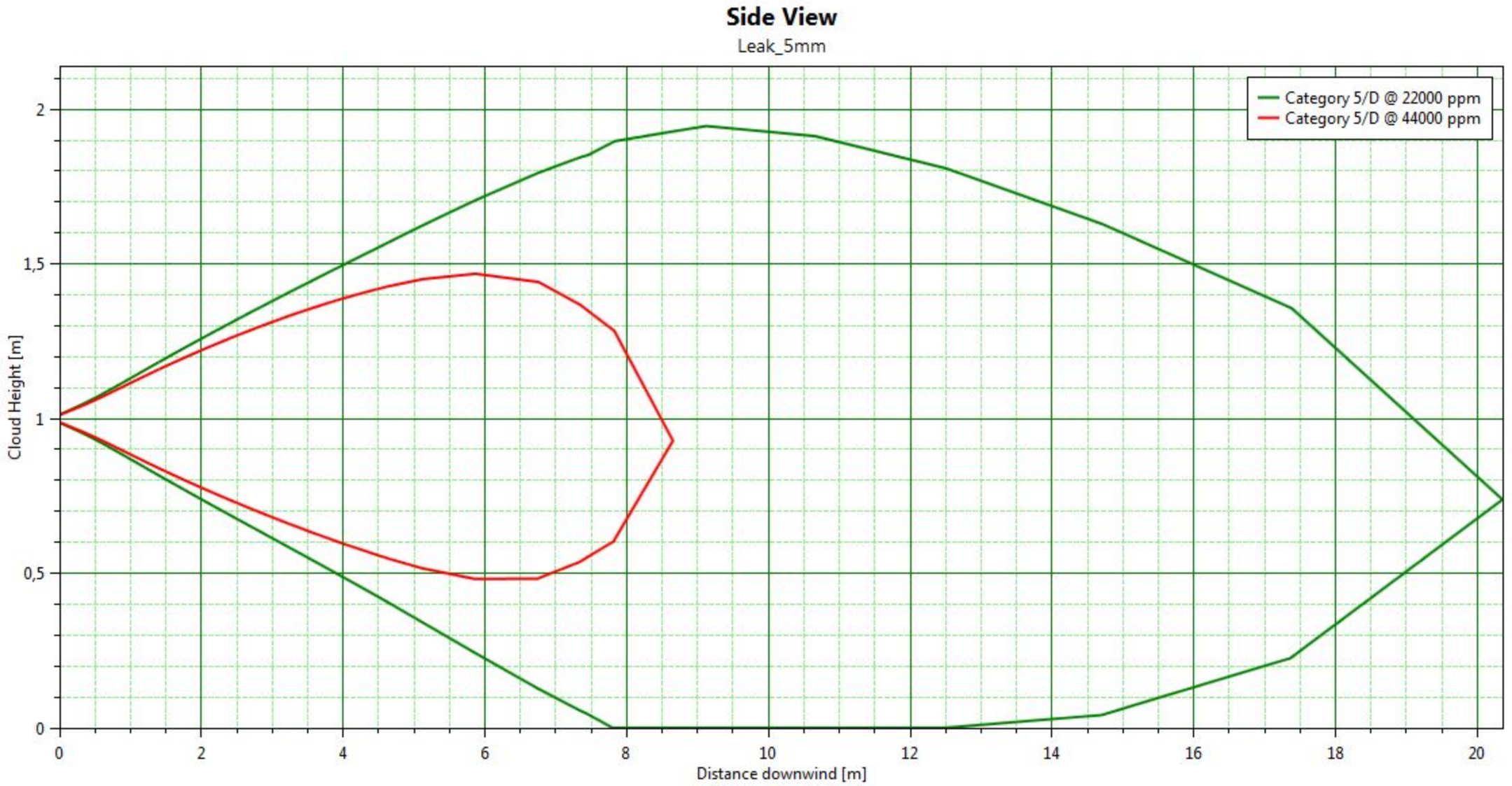
| | |
|---|---|
| Audit Number | 94612 |
| Averaging time | Flammable (18,75 s) |
| Equipment | pipe_70bar |
| Material | METHANE |
| Reference | METHANE |
| Offset Distance | 0 m |
| Program | Phast 7,21 |
| Scenario | Leak_5mm |
| Time | 59,3957 s |
| Weather | Category 2/F |
| Workspace | 17129I_LNG_rev00 |



| | |
|---|---|
| Audit Number | 94612 |
| Averaging time | Flammable (18,75 s) |
| Downwind Distance | 20 m |
| Equipment | pipe_70bar |
| Material | METHANE |
| Reference | METHANE |
| Program | Phast 7,21 |
| Scenario | Leak_5mm |
| Time | 30,1978 s |
| Weather | Category 2/F |
| Workspace | 17129I_LNG_rev00 |



| | |
|---|---|
| Audit Number | 94612 |
| Averaging time | Flammable (18,75 s) |
| Equipment | pipe_70bar |
| Material | METHANE |
| Reference | METHANE |
| Offset Distance | 0 m |
| Program | Phast 7,21 |
| Scenario | Leak_5mm |
| Time | 59,1083 s |
| Weather | Category 5/D |
| Workspace | 17129I_LNG_rev00 |



| | |
|---|---|
| Audit Number | 94612 |
| Averaging time | Flammable (18,75 s) |
| Downwind Distance | 10 m |
| Equipment | pipe_70bar |
| Material | METHANE |
| Reference | METHANE |
| Program | Phast 7,21 |
| Scenario | Leak_5mm |
| Time | 59,1083 s |
| Weather | Category 5/D |
| Workspace | 17129I_LNG_rev00 |