Appendix 4F –PHAST Input Parameters

Kerry DG Warehouse

Parameters

Discharge Parameters

Continuous Critical Weber number	12.5	
Instantaneous Critical Weber number	12.5	
Venting equation constant	24.82	
Relief valve safety factor	1.2	
Minimum RV diameter ratio	1	
Critical pressure greater than flow phase	0.3447	bar
Maximum release velocity	500	m/s
Minimum drop diameter allowed	0.01	um
Maximum drop diameter allowed	1E4	um
Default Liquid Fraction	1	fraction
Continuous Drop Slip factor	1	
Instantaneous Drop Slip factor	1	
Number of Time Steps	100.00	
Maximum Number of Data Points	1,000.00	
Tolerance	0.0001	
Thermal coupling to the wall	No modelling of heat transfer	
Use Bernoulli for forced -phase liq-liq discharge	Use compressible flow eqn	
Capping of pipe flow rates	Use leak scenario cap, disallow flashing	
Velocity capping method	FixedVelocity	
Droplet Method - continuous only	Modified CCPS	
Thermodynamic Option for Gas Pipellines	Non-ideal Gas	
Excess Flow Valve velocity head losses	0	
Non-Return Valve velocity head losses	0	
Shut-Off Valve velocity head losses	0	
Frequency of bends in long pipes	0	/m
Frequency of couplings in long pipes	0	/m
Frequency of junctions in long pipes	0	/m
Line length	10	m
Pipe roughness	0.0457	mm
Air changes	6.44	/hr
Elevation	1	m
Atmospheric Expansion Method	Closest to Initial Conditions	
Tank Roof Failure Model Effects	Instantaneous effects	
Frequency of Excess Flow Valves	0	/m
Frequency of Non-Return Valves	0	/m
Frequency of Shut-Off Valves	0	/m
Mechanism for forcing droplet breakup - Inst.	Use flashing correlation	
Mechanism for forcing droplet breakup - Cont	Do not force correlation	
Flashing in the orifice	No flashing in the orifice	
Handling of droplets	Not Trapped	
Indoor mass modification factor	3	
Vacuum Relief Valve	Operating	
Vacuum Relief Valve Set Point	0	bar

Dispersion Parameters

PARAMETERS REPORT

Expansion zone length/source diameter ratio	0.01	
Near Field Passive Entrainment Parameter	1	
Jet Model	Morton et.al.	
Jet entrainment coefficient alpha1	0.17	
Jet entrainment coefficient alpha2	0.35	
Drag coefficient between plume and air	0	
Dense cloud parameter gamma - continuous	0	
Dense cloud parameter gamma - instant	0.3	
Dense cloud parameter K - continuous	1.15	
Dense cloud parameter K - instantaneous	1.15	
Modeling of instantaneous expansion	Standard Method	
Maximum Cloud/Ambient Velocity Difference	0.1	
Maximum Cloud/Ambient Density Difference	0.015	
Maximum Non-passive entrainment fraction	0.3	
Maximum Richardson number	15	
Distance multiple for full passive entrainment	2	
Core Averaging Time	18.75	s
Ratio instantaneous/continuous sigma-y	1	
Ratio instantaneous/continuous sigma-z	1	
Droplet evaporation thermodynamics model	Rainout, Non-equilibrium	
Ratio Droplet/ expansion velocity for inst. release	0.8	
Expansion energy cutoff for droplet angle	0.69	kJ/kg
Coefficient of Initial Rainout	0	
Flag to reset rainout position	Do not reset rainout position	
Richardson Number for passive transition above pool	0.015	
Pool Vaporization entrainment parameter	1.5	
Richardson number criterion for cloud lift-off	-20	
Flag for Heat/Water vapor transfer	Heat and Water	
Surface over which the dispersion occurs	Land	
Minimum temperature allowed	-262.1	degC
Maximum temperature allowed	626.9	degC
Minimum release velocity for cont. release	0.1	m/s
Minimum Continuous Release Height	0	m
Maximum distance for dispersion	5E4	m
Maximum height for dispersion	1000	m
Minimum cloud depth	0.02	m
Treatment of top mixing layer	Constrained	
Model In Use	Best Estimate	
Lee Length	Calculate	
Specified Lee Length	0	m
Lee Half-Width	Calculate	
Lee Height	Calculate	
K-Factor	Calculate	
Specified K-Factor	0.1	
Switch Distance	Calculate	
Specified Switch Distance	0	m
Maximum Initial Step Size	10	m
Minimum Number of Steps per Zone	5.00	
Factor for Step Increase	1.2	
Maximum Number of Output Steps	1,000.00	
Flag for finite duration correction	QI without Duration Adjustment	

PARAMETERS REPORT

Quasi-instantaneous transition parameter	0.8	
Relative tolerance for dispersion calculations	0.1	
Relative tolerance for droplet calculations	0.001	
Initial integration step size - Instantaneous	0.01	s
Initial integration step size - Continuous	0.01	m
Maximum integration step size - Instantaneous	100	s
Maximum integration step size - Continuous	100	m
Impingement Option	Use Velocity Modification Factor	
Impinged velocity limit	500	m/s
Impinged Velocity Factor	0.25	
Dispersion Model to use	Version 2 model	
Fixed step size - Instantaneous	0.01	s
Fixed step size - Continuous	0.1	m
Number of fixed size output steps	20.00	
Multiplier for output step sizes	1.2	

Explosion Parameters

Over Pressure Level 1	0.02068	bar
Over Pressure Level 2	0.1379	bar
Over Pressure Level 3	0.2068	bar
Explosion Location Criterion	Cloud Front (LFL Fraction)	
Minimum explosive mass	0	kg
Explosion efficiency	10	%
Air or Ground burst	Air burst	
Explosion Mass Modification Factor	3	
Use of mass modification factor	Early and late explosions	

Fireball and BLEVE Blast Parameters

Maximum surface emissive power	400	kW/m2
Calculate Dose	Unselected	
Calculate Probit	Unselected	
Calculate Lethality	Unselected	
TNO model flame temperature	1727	degC
Mass Modification Factor	2	
Calculation method for fireball	DNV Recommended	
Fireball Maximum Exposure Duration	20	s
Intensity Levels (1)	4	kW/m2
Intensity Levels (2)	12.5	kW/m2
Intensity Levels (3)	37.5	kW/m2
Intensity Levels (4)	-9.95e+033	kW/m2
Intensity Levels (5)	-9.95e+033	kW/m2
Intensity Levels (6)	-9.95e+033	kW/m2
Intensity Levels (7)	-9.95e+033	kW/m2
Intensity Levels (8)	-9.95e+033	kW/m2
Intensity Levels (9)	-9.95e+033	kW/m2
Intensity Levels (10)	-9.95e+033	kW/m2
Probit Levels (1)	2.73	
Probit Levels (2)	3.72	
Probit Levels (3)	7.5	
Probit Levels (4)	-9.95e+036	
Probit Levels (5)	-9.95e+036	

PARAMETERS REPORT

Probit Levels (6)	-9.95e+036	
Probit Levels (7)	-9.95e+036	
Probit Levels (8)	-9.95e+036	
Probit Levels (9)	-9.95e+036	
Probit Levels (10)	-9.95e+036	
Dose Levels (1)	1.27E6	
Dose Levels (2)	5.8E6	
Dose Levels (3)	2.51E7	
Dose Levels (4)	-9.95e+036	
Dose Levels (5)	-9.95e+036	
Dose Levels (6)	-9.95e+036	
Dose Levels (7)	-9.95e+036	
Dose Levels (8)	-9.95e+036	
Dose Levels (9)	-9.95e+036	
Dose Levels (10)	-9.95e+036	
Lethality Levels (1)	0.01	
Lethality Levels (2)	0.1	
Lethality Levels (3)	1	
Lethality Levels (4)	-9.95e+036	
Lethality Levels (5)	-9.95e+036	
Lethality Levels (6)	-9.95e+036	
Lethality Levels (7)	-9.95e+036	
Lethality Levels (8)	-9.95e+036	
Lethality Levels (9)	-9.95e+036	
Lethality Levels (10)	-9.95e+036	
Ground Reflection	Ground Burst	
Ideal Gas Modeling	Model as real gas	
Minimum Distance	0	m
Number of Distance Points	100.00	

Flammable Parameters

Height for calculation of flammable effects	0	m
Flammable result grid step in X-direction	10	m
LFL fraction to finish	0.85	
Angle of inclination	0	deg
Observer direction	Variable	
Flammable mass calculation method	Mass between LFL and UFL	
Flammable Base averaging time	18.75	s
Cut Off Time for Short Continuous Releases	20	s
Observer type radiation modelling flag	Planar	
Probit A Value	-36.38	
Probit B Value	2.56	
Probit N Value	1.333	
Height for reports	Centreline Height	
Angle of orientation	0	deg
Relative tolerance for radiation calculations	0.01	fraction
Number of Lethality Ellipses	5.00	
Ellipse linear spacing variable	Probit	
Minimum Probability Of Death	0.01	fraction
Number of radiation/distance points in linked radiation calculations	50.00	
Method for fitting ellipse to flash fire shape	ChiSq method	

PARAMETERS REPORT

Absolute tolerance for linked radiation calcs	1e-010	
Solar radiation	Exclude from calculations	
For time-varying releases	Don't Model Short Duration Effects	
Match fireball duration and mass released	No	
General Parameters		
Maximum release duration	3600	s
Height for concentration output	0	m
Rotation	0	deg
Lower Elevation	0	m
Multicomponent aerosol behaviour	Single aerosol modelling	
Jet Fire Parameters		
Maximum SEP for a Jet Fire	400	kW/m2
Jet Fire Averaging Time	20	s
Calculate Dose	Unselected	
Calculate Probit	Unselected	
Calculate Lethality	Unselected	
Crosswind Angle	0	deg
Correlation	DNV Recommended	
Horizontal Options	Use standard method	
Rate Modification Factor	3	
Jet Fire Maximum Exposure Duration	20	s
Emissivity Method	E and F calculated	
Intensity Levels (1)	4	kW/m2
Intensity Levels (2)	12.5	kW/m2
Intensity Levels (3)	37.5	kW/m2
Intensity Levels (4)	-9.95e+033	kW/m2
Intensity Levels (5)	-9.95e+033	kW/m2
Intensity Levels (6)	-9.95e+033	kW/m2
Intensity Levels (7)	-9.95e+033	kW/m2
Intensity Levels (8)	-9.95e+033	kW/m2
Intensity Levels (9)	-9.95e+033	kW/m2
Intensity Levels (10)	-9.95e+033	kW/m2
Probit Levels (1)	2.73	
Probit Levels (2)	3.72	
Probit Levels (3)	7.5	
Probit Levels (4)	-9.95e+036	
Probit Levels (5)	-9.95e+036	
Probit Levels (6)	-9.95e+036	
Probit Levels (7)	-9.95e+036	
Probit Levels (8)	-9.95e+036	
Probit Levels (9)	-9.95e+036	
Probit Levels (10)	-9.95e+036	
Dose Levels (1)	1.27E6	
Dose Levels (2)	5.8E6	
Dose Levels (3)	2.51E7	
Dose Levels (4)	-9.95e+036	
Dose Levels (5)	-9.95e+036	
Dose Levels (6)	-9.95e+036	
Dose Levels (7)	-9.95e+036	

PARAMETERS REPORT

Dose Levels (8)	-9.95e+036	
Dose Levels (9)	-9.95e+036	
Dose Levels (10)	-9.95e+036	
Lethality Levels (1)	0.01	
Lethality Levels (2)	0.1	
Lethality Levels (3)	1	
Lethality Levels (4)	-9.95e+036	
Lethality Levels (5)	-9.95e+036	
Lethality Levels (6)	-9.95e+036	
Lethality Levels (7)	-9.95e+036	
Lethality Levels (8)	-9.95e+036	
Lethality Levels (9)	-9.95e+036	
Lethality Levels (10)	-9.95e+036	
Pool Fire Parameters		
Continuous releases	10	s
Calculate Dose	Not selected	
Calculate Probit	Not selected	
Calculate Lethality	Selected	
MaxExposureDuration	20	s
Radiative fraction for general fires	0.4	fraction
Intensity Levels (1)	4	kW/m2
Intensity Levels (2)	12.5	kW/m2
Intensity Levels (3)	37.5	kW/m2
Intensity Levels (4)	-9.95e+033	kW/m2
Intensity Levels (5)	-9.95e+033	kW/m2
Intensity Levels (6)	-9.95e+033	kW/m2
Intensity Levels (7)	-9.95e+033	kW/m2
Intensity Levels (8)	-9.95e+033	kW/m2
Intensity Levels (9)	-9.95e+033	kW/m2
Intensity Levels (10)	-9.95e+033	kW/m2
Dose Levels (1)	1.27E6	
Dose Levels (2)	5.8E6	
Dose Levels (3)	2.51E7	
Dose Levels (4)	-9.95e+036	
Dose Levels (5)	-9.95e+036	
Dose Levels (6)	-9.95e+036	
Dose Levels (7)	-9.95e+036	
Dose Levels (8)	-9.95e+036	
Dose Levels (9)	-9.95e+036	
Dose Levels (10)	-9.95e+036	
Probit Levels (1)	2.73	
Probit Levels (2)	3.72	
Probit Levels (3)	7.5	
Probit Levels (4)	-9.95e+036	
Probit Levels (5)	-9.95e+036	
Probit Levels (6)	-9.95e+036	
Probit Levels (7)	-9.95e+036	
Probit Levels (8)	-9.95e+036	
Probit Levels (9)	-9.95e+036	
Probit Levels (10)	-9.95e+06	

PARAMETERS REPORT

Lethality Levels (1)	0.03	
Lethality Levels (2)	0.5	
Lethality Levels (3)	0.9	
Lethality Levels (4)	-9.95e+036	
Lethality Levels (5)	-9.95e+036	
Lethality Levels (6)	-9.95e+036	
Lethality Levels (7)	-9.95e+036	
Lethality Levels (8)	-9.95e+036	
Lethality Levels (9)	-9.95e+036	
Lethality Levels (10)	-9.95e+036	

Pool Vaporization Parameters

Toxics cut-off rate for pool evaporation	0.001	kg/s
Flammable cut-off rate for pool evaporation	0.1	kg/s
Concentration power to use in pool rate load calculation	1	
Maximum number of pool evaporation rates	10.00	
Pool minimum thickness	5	mm
Surface thermal conductivity	0.00221	kJ/m.s.deg
Surface roughness factor	2.634	
Surface thermal diffusivity	9.48E-7	m2/s
Type of Bund Surface	Concrete	
Bund Height	0	m
Bund Failure Modeling	Bund cannot fail	

Toxic Parameters

Toxics: minimum probability of death	0.001	
Toxics: height for calculation of effects	0	m
Toxics: results grid step in Y-direction	2.5	m
Toxics: results grid step in X-direction	25	m
Multi-comp. toxic calc. method	Mixture Probit	
Toxic Averaging Time - New Parameter	600	s
Probit Calculation Method	Use Probit	
Building Exchange Rate	4	/hr
Tail Time	1800	s
Indoor Calculations	Unselected	
Wind Dependent Exchange Rate	Case Specified	
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

Weather Parameters

Atmospheric pressure	1.013	bar
Atmospheric molecular weight	28.97	
Atmospheric specific heat at constant pressure	1.004	kJ/kg.degK
Wind speed reference height	10	m
Temperature reference height	0	m
Cut-off height for wind speed profile	1	m
Wind speed profile	Power Law	
Atmospheric T and P Profile	Temp.Logarithmic; Pres.Linear	
Atmospheric Temperature	25	degC
Relative Humidity	0.7	fraction

PARAMETERS REPORT

Parameter	0.1	
Length	183.2	mm
Surface Roughness	Use Parameter	
Surface Temperature for Dispersion Calculations	20	degC
Surface Temperature for Pool Calculations	20	degC
Solar Radiation Flux	0.5	kW/m2
Building Exchange Rate	4	/hr
Tail Time	1800	s
Surface Type	User-defined	
Mixing Layer Height for Pasquil Stability A	1300	m
Mixing Layer Height for Pasquil Stability A/B	1080	m
Mixing Layer Height for Pasquil Stability B	920	m
Mixing Layer Height for Pasquil Stability B/C	880	m
Mixing Layer Height for Pasquil Stability C	840	m
Mixing Layer Height for Pasquil Stability C/D	820	m
Mixing Layer Height for Pasquil Stability D	800	m
Mixing Layer Height for Pasquil Stability E	400	m
Mixing Layer Height for Pasquil Stability F	100	m
Mixing Layer Height for Pasquil Stability G	100	m