

# Introducing our **FREE** Dropped Object Software

**DROPS Forum**  
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# Presentation Overview

- Who we are
- Subsea Dropped Objects
- Recommended Practice
- Live Demonstration



# Who we are

- Founded 2015
- We are passionate about our software
- We want to make understanding risk straightforward for our customers
- Offer FREE Dropped Object Risk Assessment Software



# Subsea Dropped Objects

- Suspended loads dropped into sea may damage subsea infrastructure, including pipelines
- Considered a Major Accident Hazard (MAH)
- Requires Risk Assessment to demonstrate risks have been reduced to ALARP
- Further risk reduction measures may be required



# Subsea Dropped Objects

- Further risk reduction measures include, but are not limited to:
  - Exclusion zones for lifting being put in place
  - Limits imposed on max. load lifted
  - Reduction in number of lifts performed
- For new builds:
  - Separation between crane and pipeline
  - Burial of pipeline
  - Protection of pipeline e.g. rock dumping, mattresses
  - Install Subsea Isolation Valve (SSIV)



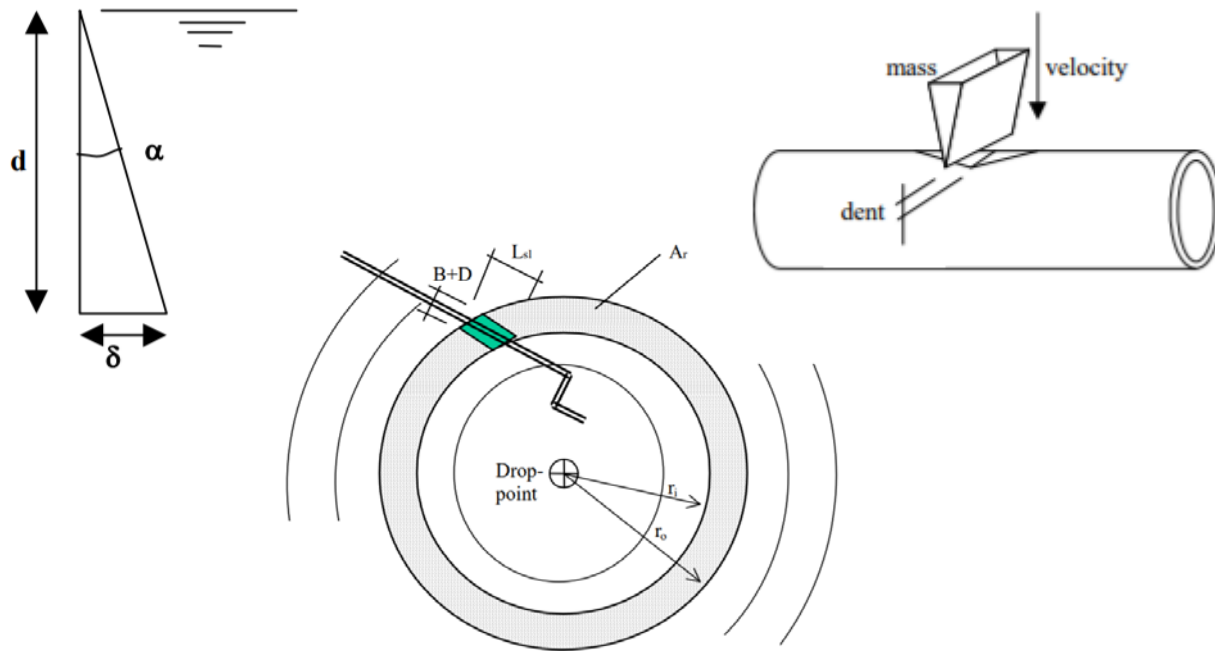
# Recommended Practice

- DNV-RP-F107 'Risk Assessment of Pipeline Protection'
- Outlines methodology for carrying out a Quantitative Risk Assessment (QRA) of damaging a subsea pipeline
- Used widely throughout industry
- Our software has been validated with the techniques within this document



# Recommended Practice

- DNV-RP-F107 uses calculations to determine:
  - Probability of impact from dropped load
  - Risk of hydrocarbons being released



**LIVE DEMONSTRATION**





# Live Demonstration

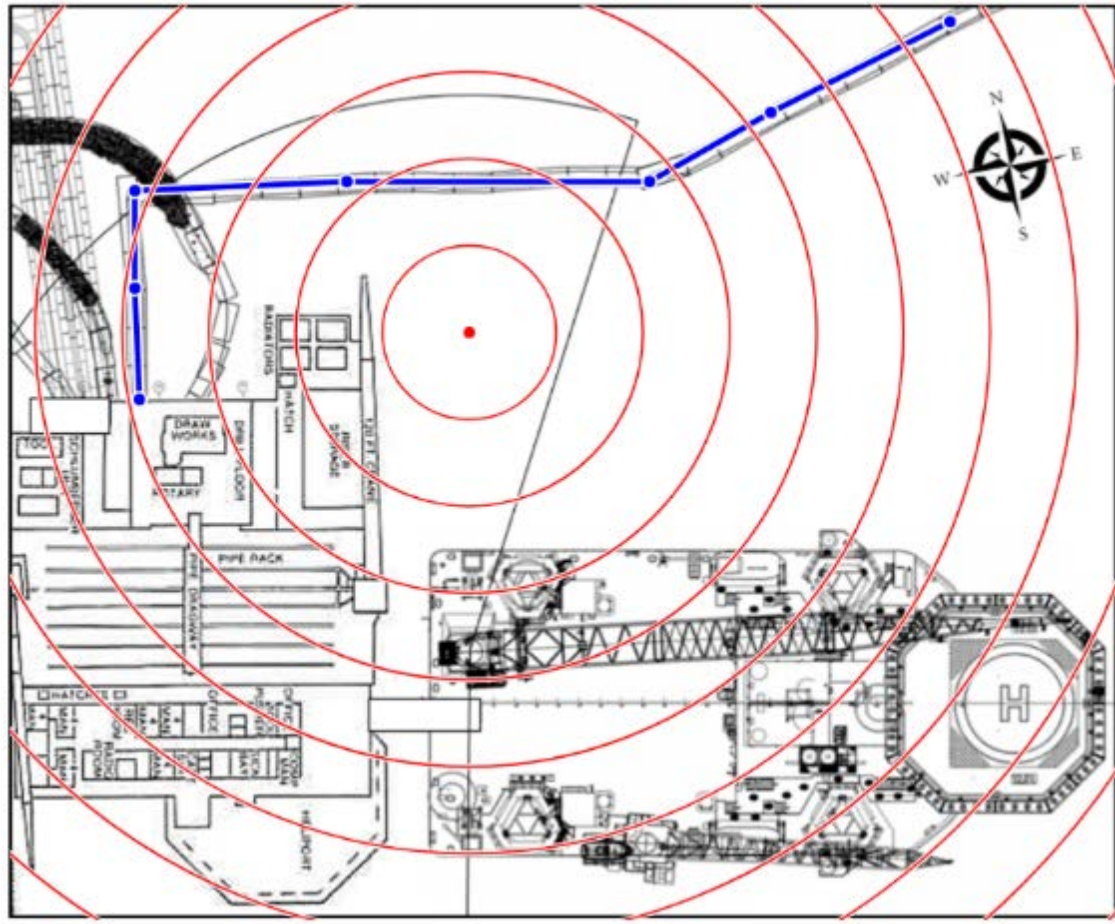
- New Study
- Draw-Pipeline™ Tool
- Design Basis
- Results
- PDF Download





# Draw-Pipeline™ Tool

- Scale image, choose drop-point and then draw the pipeline



# Design Basis

- Enter pipeline details, number and size of lifts, water depth etc.

| Pipeline Data               |                                     |
|-----------------------------|-------------------------------------|
| Type of pipeline            | Steel Pipeline ▼                    |
| Contains Hydrocarbons?      | <input checked="" type="checkbox"/> |
| Outer Diameter (D)          | 508 mm                              |
| Wall Thickness (t)          | 18 mm                               |
| Yield Stress ( $\sigma_y$ ) | 450 N/mm <sup>2</sup>               |

| Additional Protection                      |        |
|--|--------|
| Impact resistance of additional protection | 0 kJ ? |

| Environmental Data |       |
|--------------------|-------|
| Water Depth        | 100 m |

| Classification of Objects |                  |                        |             |                        |
|---------------------------|------------------|------------------------|-------------|------------------------|
| No                        | Description      | Weight in air (tonnes) | Breadth (m) | Number lifted per year |
| 1                         | Flat/Long shaped | <2                     | 12          | 30                     |
| 2                         |                  | 2 to 8                 | 12          | 50                     |
| 3                         |                  | >8                     | 12          | 5                      |
| 4                         | Round/Box shaped | <2                     | 5           | 40                     |
| 5                         |                  | 2 to 8                 | 5           | 15                     |
| 6                         |                  | >8                     | 5           | 35                     |
| 7                         | Round/Box shaped | >>8                    | 5           | 0                      |
|                           |                  |                        |             | 175                    |



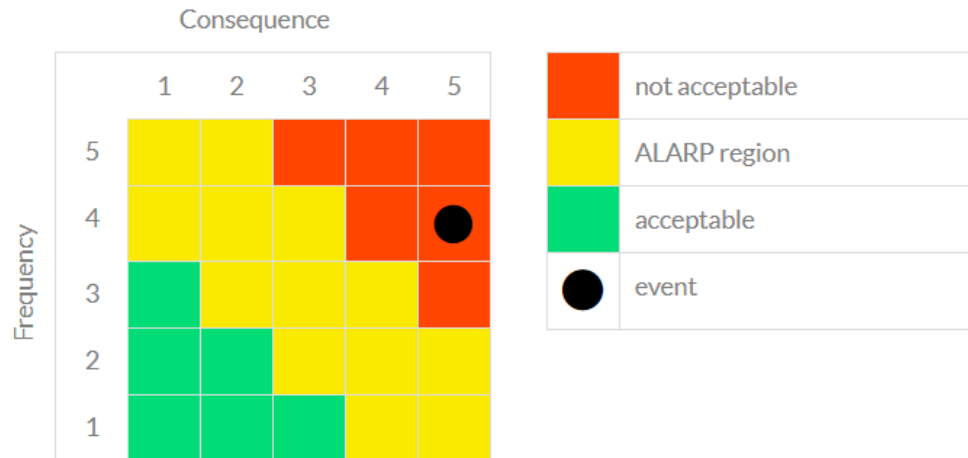
# Results

- Risk assessment performed automatically
- Results available instantly



|                              |          |                        |
|------------------------------|----------|------------------------|
| Annual hit frequency         | 2.57e-03 |                        |
| Annual frequency of failure  | 2.32e-03 | * for "Steel Pipeline" |
| Frequency of ignited release | 2.32e-04 |                        |

Example Risk Matrix



# PDF Download



- Technical Report immediately available for download

**SALUS TECHNICAL**

Salus Technical®  
DROPPED OBJECT RISK ASSESSMENT REPORT

|               |                    |
|---------------|--------------------|
| Report Number | 010 - 004 - 005    |
| Study Title   | Example Study 2    |
| Client        | Salus              |
| Date          | September 17, 2017 |

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Example Study 2

## 2.0 STUDY DESCRIPTION

### 2.1 Layout of Infrastructure

The access layout drawing uploaded is shown in Figure 1.

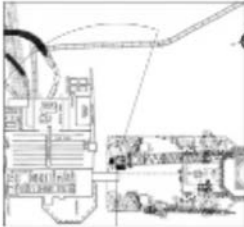


Figure 1 – Subsee Layout

Using the software, this figure was then scaled, a drop point added and the subsee layout drawing is shown in Figure 2.

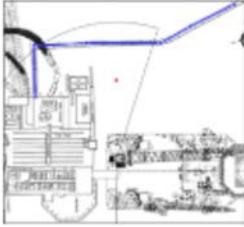


Figure 2 – Subsee Layout with marked up drop point

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Example Study 2

### 3.3.2. Hit Probability

The length of the pipeline within 10m sections is shown in Table 4.

Table 4 – Length of pipeline within 10m interval rings on the seabed

|           | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 | 80-90 | 90-100 | 100-110 | 110-120 | 120-130 |
|-----------|------|-------|-------|-------|-------|-------|-------|-------|-------|--------|---------|---------|---------|
| length(m) | 0.0  | 19.8  | 28.7  | 40.3  | 17.7  | 10.1  | 6.0   | 0.0   | 0.0   | 0.0    | 0.0     | 0.0     | 0.0     |

For each of the lifted objects, a dropped frequency of 1.2E-5 per lift, and an angular deviation as the dropped object sinks is considered [1]. Using this information and assuming the normal probability distribution of the dropped load described above, a probability of hits per 10m interval ring of the seabed can be calculated for each zone.

From these hit frequencies, and considering the length of exposed pipeline and size of dropped object, a hit frequency is calculated. For this assessment, the impact frequencies are summarised in Table 5 below.

Table 5 - Impact frequency

| No | Description      | Weight in air (tonnes) | Number lifted per year | Drop frequency per year | Conditional hit probability | Hit frequency |
|----|------------------|------------------------|------------------------|-------------------------|-----------------------------|---------------|
| 1  | Flat/Long shaped | <2                     | 7.00e+02               | 1.20e-05                | 1.47e-01                    | 1.24e-03      |
| 2  |                  | 5.00e+01               | 1.20e-05               | 1.30e-01                | 7.80e-05                    |               |
| 3  |                  | >8                     | 5.00e+00               | 1.20e-05                | 5.58e-02                    | 3.95e-06      |
| 4  | Round/Box shaped | <2                     | 5.00e+02               | 1.20e-05                | 0.06e-02                    | 3.64e-04      |
| 5  |                  | 2 to 8                 | 2.50e+03               | 1.20e-05                | 2.90e-02                    | 8.60e-04      |
| 6  | Round/Box shaped | >8                     | 2.50e+02               | 1.20e-05                | 5.53e-03                    | 1.96e-05      |
| 4  |                  | >8                     | 0.00e+00               | 1.20e-05                | 4.85e-04                    | 0.00e+00      |

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# Summary

- Completely FREE
- Available for use right now at [www.salus-technical.com](http://www.salus-technical.com)
- Validated with DNV-RP-F107
- Dropped Object Risk Assessment performed automatically
- Results and Technical Report available immediately
- Thank you for listening





# Any questions?

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