OH-001-2104
Trans Mountain Pipeline ULC (Trans Mountain)
Trans Mountain Expansion Project (Project)
File OF-Fac-Oil-T260-2013-03 02

Raincoast Conservation Foundation Information Request No. 2 to Trans Mountain Pipeline ULC

Table of Contents

EFFECTS OF CLIMATE CHANGE ON THE PROJECT

2.1 Consideration of Climate Change in Model Inputs

References: i) A3S0Y9, Application Volume 4A, Project Design and Execution – Engineering, Section 3.4.4.3.2, PDF page 3 of 35.

ii) Helm, K. P., N. L. Bindoff, and J. A. Church. 2010. Changes in the global hydrological cycle inferred from ocean salinity. Geophys. Res. Lett., 37, L18701, doi:10.1029/2010GL044222, online at http://onlinelibrary.wiley.com/doi/10.1029/2010GL044222/full.

iii) A3S0R0, Application Volume 2, Project Overview, Economics and General Information, Section 2.9.2, PDF page 5 of 43.

iv) A3S5G9, Volume 8C, Modeling the fate and behaviour of marine oil spills for the Trans Mountain Expansion Project, PDF pages 18 to 42 of 72.

v) A3S5G9, Volume 8C, Modelling the fate and behaviour of marine oil spills for the Trans Mountain Expansion Project, Sections 8 and 9, PDF pages 42 to 62 of 72.

vi) A3W9K1 to A3W9K9, Response to NEB IR 1.62b, Detailed Quantitative ecological risk assessment for loading accidents and marine spills.

vii) A3S5G9, Volume 8C, Modelling the fate and behaviour of marine oil spills for the Trans Mountain Expansion Project, Section 3.1.1, PDF pages 19 and 20 of 72.

vii) A3S5G9, Volume 8C, Modelling the fate and behaviour of marine oil spills for the Trans Mountain Expansion Project, Section 6, PDF pages 38 to 42 of 72.

Preamble: Reference (i) states that a rise in water level due to the effects of climatic change is expected, and that "according to an assessment by DFO, by the year 2100, the Fraser River Delta could experience a mean relative sea level rise of 0.55 m with contributions of 0.29 m from global eustatic rise, 0.28 m from deltaic subsidence, and -0.02 m from glacial isostatic adjustment." Reference (ii) provides an example of existing and predicted climate change on ocean temperature, density, salinity, oceanographic processes, and the hydrological cycle.

Reference (i) illustrates how climate change might affect model parameters and assumptions. References (i) and (ii) provide examples of future conditions under climate change. Models that are static to future conditions may lead to inaccurate results and inappropriate conclusions.

Reference (iii) states that the project infrastructure, and by association tanker traffic, is not expected to be abandoned for more than 50 years once operations commence.

Reference (iv) briefly describes the models H3D, SPILLCALC and SWAN.

Reference (v) provides an example of the kind of result that the H3D, SPILLLCALC and SWAN models combine to produce.

Reference (vi) provides an example of the kind of conclusions that are based on the results produced in reference (v).

Reference (vii) provides a description of the more detailed grids used in H3D.

Reference (viii) provides a description of the models CALMET and CALPUFF.

Request: Please describe how predicted changes due to climate change including extremes of temperature, density, salinity, and weather, and changes to water chemistry and sea level, have been accounted for in models that predict the fate and behaviour of diluted bitumen and other petroleum pseudo-components. Specifically:

a. Please confirm whether the expected life of the project and its infrastructure is 50 years. If this is not the case, please provide the expected minimum and maximum range of the project's life expectancy.

b. Please use the project's planned years of operation as identified in 1a) to inform questions 1c through 1i.

c. Has variance in water temperature, including unprecedented extremes that are projected under climate change for the Fraser River, the Fraser River estuary, and the marine waters of the Salish Sea, as described in Reference (ii), been accounted for in the spill and oil dispersion models H3D, SWAN, and SPILLCALC?

> c1. If yes, please confirm this and provide an explanation as to how the model results (for example, Reference (v)), and the conclusions they support (for example, Reference (vi)), account for projected climate change scenarios and describe the attendant uncertainty this introduces to the conclusions supported, including the significance of risk informed by the model results.
>
> c2. If no, please confirm this and provide an explanation as to why greater variance in water temperature is not relevant to environmental risks to the project during the project's planned years of operation.

d. Has variance in water density in the Fraser River, Fraser estuary, and marine waters of the Salish Sea been accounted for in H3D, SWAN and SPILLCALC, including density changes associated with climate change?

> d1. If yes, please confirm this and provide an explanation as to how the model results, and the conclusions they support, account for projected climate change scenarios and describe the attendant uncertainty this introduces to the conclusions supported, including the significance of risk informed by the model results.
>
> d2. If no, please confirm this and provide an explanation as to why water density extremes are not relevant to environmental risk for the project's planned years of operation.

e. Have projected changes in water chemistry (e.g. salinity) that would accompany climate change in the marine and estuarine waters of the Salish Sea been accounted for in H3D, SWAN, and SPILLCALC?

> e1. If yes, please confirm this and provide an explanation as to how the model results and the conclusions they support account for projected climate change scenarios, and describe the attendant uncertainty this introduces to the conclusions supported, including the significance of risk informed by the model results.
>
> e2. If no, please confirm this and provide an explanation as to why salinity and other water chemistry changes are not relevant to environmental risk for the project's planned years of operation.

f. Have any projected changes in water levels and corresponding shifts in current and flow patterns with the study region, including those within the more detailed grids for the Strait of Georgia and Fraser River delta area, the Fraser River, and Burrard Inlet (Reference (vii)) been accounted for in H3D, SWAN, and SPILLCALC?

> f1. If yes, please confirm this and provide an explanation as to how the model results, and the conclusions they support, account for projected climate change scenarios and describe the attendant uncertainty this introduces to the conclusions supported, including the significance of risk informed by the model results.
>
> f2. If no, please confirm this and provide an explanation as to why changing water levels and corresponding shifts in current and flow patterns are not relevant to environmental risk for the project's planned years of operation.

g. Have natural cycles in marine waters, including El Niño and the Pacific Decadal Oscillation, which are patterns of temperature and pressure change that occur regularly and effect the Salish Sea, been accounted for in H3D, SWAN and SPILLCALC?

> g1. If yes, please confirm this and provide an explanation as to how the model results, and the conclusions they support, account for decadal patterns and describe the attendant uncertainty this introduces to the conclusions, including the significance of risk informed by the model results.
>
> g2. If no, please confirm this and provide an explanation as to why these cycles are not relevant to environmental risk for the project's planned years of operation.

h. Have projected changes in weather patterns, including extreme weather events, associated with climate change that can affect the Fraser River, Fraser estuary, and marine waters of the Salish Sea, been accounted for in H3D, SWAN, and SPILLCALC?

> h1. If yes, please confirm this and provide an explanation as to how the model results, and the conclusions they support, account for extreme weather events and describe the attendant uncertainty this introduces to the conclusions supported, including the significance of risk informed by the model results.
>
> h2. If no, please confirm this and provide an explanation as to why extreme weather events are not relevant to environmental risk for the project's planned years of operation.

i. Have projected changes in meteorological conditions, including extreme weather events, associated with climate change in the complex coastal terrain of the Salish Sea been accounted for in the air dispersion model CALPUFF and CALMET (Reference (viii))?

> i1. If yes, please confirm this and provide an explanation as to how the model results, and the conclusions they support, account for extreme weather events and describe the attendant uncertainty this introduces to the conclusions supported, including the significance of risk informed by the model results.
>
> i2. If no, please confirm this and provide an explanation as to why this is not relevant to environmental risk for the project's planned years of operation.

CREDIBLE WORST CASE SCENARIO

2.2 Credible Worst Case Spill Size

References: i) A3S5F6, Application Volume 8C TR 12 TERMPOL 3.15, Sections 9.1.1 to 9.1.5, PDF pages 35 to 41 of 100.

ii) A3S5F6, Application Volume 8C TR 12 TERMPOL 3.15, Section 9.9.1, Table 2.6, PDF page 35 of 100.

Preamble: Reference (i) describes in part the methods used to derive the "credible worst case scenario" (CWC) and corresponding spill sizes for project related oil tankers. It states that "total loss" is not considered a viable scenario as there has never been such an event with a double-hulled tanker. In this case, the definition of a "credible worst case" scenario is not given in TERMPOL 2001 guidelines, and Trans Mountain Pipeline (TMP) has chosen a "90th percentile event causing uncontrolled outflow from a tanker's cargo oil tanks" as the definition of credible worst case scenario for this project. Reference (ii) shows the estimated cargo size for the Aframax tanker used in the scenarios.

Independent peer review and transparency is important for model and simulation verification and repeatability. Often, software packages such as the Naval Architecture Package (NAPA), which has been used in the determination of CWC oil cargo releases and which costs approximately $50,000-$150,000, is either proprietary or prohibitively expensive, thus precluding independent review. As other models (such as SPILLCALC) rely heavily on the CWC cargo sizes, this in turn precludes transparency for conclusions based on the determination of CWC cargo spill volumes.

Request: a. Please confirm that the loss of less than approximately 14% of the cargo (16,500 m^3 out of a total cargo of 120,263 m^3) from a partially laden oil tanker is considered a "credible worst case scenario".

b. Please explain the assumption that because an event has not occurred to date (i.e. total loss of cargo from a double hull tanker), it is outside the realm of future possibility.

c. Please provide the rationale for using the 90th percentile, as opposed to the 95th or 99th percentiles as examples.

d. Figures 34 and 35 in Reference (i) refer to distributions of spill sizes generated by Monte Carlo simulations. Please provide information on the nature of the spills that are larger than the recommended 90th percentile credible worst-case spill size. This would include the input parameters of those simulations including penetration depth and hole sizes, and the curves (those taken from IMO MARPOL regulations) that they were drawn from.

e. Please provide a detailed and explicit description of all statistical/analytical data treatments, assumptions and/or algorithms used to derive the credible worst case spill sizes for oil tankers, for both grounding and collisions, including the statistical methods and parameterisations within the Naval Architecture Package (NAPA Ltd.) software package.

f. If the Monte Carlo simulations in reference (i) were initiated and/or constrained within a size range, please provide those numbers and methods.

g. Please provide validation of the spill volumes generated by using the Monte Carlo simulations as compared to historical accidents involving groundings and collisions with comparable tankers.

h. Please provide appropriate reference information, and the references themselves if not publicly available, for any peer review that has taken place on the determination of the credible worst case scenarios.

MODEL PERFORMANCE

Preamble: The repeatability of study results is paramount to the integrity of the scientific process. Principally, the findings of a study are accepted as valid if they can be reproduced independently. Through this iterative process the body of science is advanced with bidirectional exchange of ideas, critique, and adoption of proven methods. Theories and study findings are accepted only until refuted by follow up investigation. For the scientific model to work properly and effectively, the process must be transparent allowing the data to speak for itself. If independent teams are restricted access to datasets, model environments, or information describing modelled input parameters, refuting or accepting statements and conclusions generated from model output is impossible.

2.3 Risk Analysis

References: i) A3S5F6, Application Volume 8C TR 12 TERMPOL 3.15, Section 11.2, PDF page 53 of 100.

ii) A3S5F6, Application Volume 8C TR 12 TERMPOL 3.15, Appendix 1, PDF page 70-85.

iii) A3Y3W4, Trans Mountain Response to Weaver IR No. 1, IR 1.10.g, PDF page 99 of 148.

iv) A3Y3W4, Trans Mountain Response to Weaver IR No. 1, IR 1.10.5x, PDF page 104 of 148.

v) A3Y3W4, Trans Mountain Response to Weaver IR No. 1, IR 1.10.5k.1-k.3, PDF page 100-101 of 148.

vi) A3Y3W4, Trans Mountain Response to Weaver IR No. 1, IR 1.11 c5, PDF page 121 of 148.

vii) A3Y3W4, Trans Mountain Response to Weaver IR No. 1, IR 1.10.5, IR 1.11 a5, and IR 1.11 c4, PDF pages 103, 117, and 120 of 148, respectively.

viii) A3Y3W4, Trans Mountain Response to Weaver IR No. 1, IR 1.10k1 and IR 1.11 cc3.iii, PDF pages 100 and 106 of 148, respectively.

ix) A3Y3W4, Trans Mountain Response to Weaver IR No. 1, IR 1.10k4, PDF page 101 of 148.

Preamble: Reference (i) states that the MARCS model was first developed in the 1990s and has been used extensively and peer reviewed since that time. Det Norske Veritas (DNV) states that following significant modifications of risk models, discrepancies between subsequent model versions are understood and either eliminated or documented.

Reference (ii) describes the organization and operation of the MARCS model. The MARCS model provides a general framework for the performance of marine risk calculations.

Without having a full understanding of the uncertainty and sensitivity of these models, it is impossible for the public and the NEB to have a sense of the confidence they should have in the model outputs, conclusions drawn, and ultimately the calculation of risk to the marine environment. Previous Information Requests (References (ii) through (ix)) aimed at evaluation of model confidence for MARCS, including uncertainty, sensitivity, robustness, precision, accuracy or suitability, have been:

1) denied on the basis of proprietary information (ex Ref iv),
2) referred back to material in the application that generated the question (ex Ref iii),
3) countered, based on professional opinion of the applicant or its consultants (ex Ref vii),

4) deemed adequate based on professional opinion of applicant or its consultants (ex Ref viii),
5) deemed not necessary to determine marine risk (ex Ref ix); or
6) deemed as appropriate and credible information to determine marine risk (ex Ref vii).

The rejection of requests to evaluate the model and its components run counter to transparency and peer review. The ability to repeat study results is critical in demonstrating scientific rigor.

Request: a. Please provide full citations for third party academic peer review(s) of MARCS methods and results conducted by the US National Academy of Science (Reference (i): 1996 and 2010 projects).

b. Please provide appropriate reference information, and the references themselves if not publicly available, for any other peer review of the MARCS model and its use. Please confirm whether or not these publications are from a peer-review and refereed process such as academic journals.

c. Please identify if MARCS uses classical (frequentist), Bayesian, or information theoretic statistical approaches as part of the modelling process.

d. Please provide the revision history of the MARCS model. This “log file” should include information on temporal updates, as well as any changes in statistical approaches and algorithms.

e. Please confirm that the current version of the MARCS model attempts to account for human error of maritime crew as a factor in risk analysis. If so, how?

f. Please confirm that the current version of the MARCS model is best described as a static model, as opposed to employing dynamic modelling.

g. Please list all statistical analytic tests employed by the MARCS model.

h. Please provide site-specific fault tree symbolic logic diagrams for the Collision Model and Powered Grounding Model including the probabilities of all primary faults (lowest tiers).

i. Please provide Unified Modelling Language (UML) activity diagrams for all algorithms employed by the MARCS model. The product(s) should indicate flow of work, indicating model inputs, actions, and decisions from initial to final state(s).

j. Please provide a list of all peer-reviewed and refereed journal articles that introduce, describe the modelling environment, attempt to validate with historical data, or provide critical review of the MARCS model.

k. Please explain the decision to only model frequency assessments of marine traffic for years 2018 and 2028, when the expected life of the project and its infrastructure is no less than 50 years.

2.4 Modeling of Marine Oil Spills

References: i) A3S5G9, Volume 8C, Modelling the fate and behaviour of marine oil spills for the Trans Mountain Expansion Project, PDF pages 18 to 42 of 72.

ii) A3Y3W4, TM IR response to Weaver No 1.11 5c, PDF page 121 of 148.

Preamble: SPILCALC is a proprietary model that requires a wave model (SWAN) and a 3D hydrodynamic model (H3D) to simulate the fate and behaviour of oil spills. These models are briefly described in Reference (i).

Previous questions aimed at evaluating the models' confidence, including uncertainty, sensitivity, robustness, precision, accuracy or suitability, have yet been unanswered. For example, see Reference (ii). Without a full understanding of the uncertainty and sensitivity of these models, it is impossible for the public and the NEB to have a sense of the confidence they should have in the model outputs, conclusions drawn, and the reality of oil spill scenarios portrayed.

2.4.1 H3D

Request: a. Please confirm whether the H3D model structure in Reference (i) employs classical (frequentist), Bayesian, or information theoretic statistics. If so, what are the specific statistical approaches?

Reference (ii) states that H3D was derived from GF8 in 1993.

b. Please provide the current revision history of the H3D model. This "log file" should include information on temporal updates and changes in statistical algorithms, and show how the model has adapted with advances in statistical modelling design and periodic model testing and evaluation.

c. Please list all statistical analytic tests employed by the H3D model.

d. Please provide Unified Modelling Language (UML) activity diagrams for all algorithms employed by the H3D model. The product(s) should indicate flow of work indicating model inputs, actions, and decisions from initial to final state(s).

e. Please provide a list of all peer-reviewed and refereed journal articles that introduce, describe the modeling environment of, attempt to validate with historical data, or provide critical review of the H3D model.

2.4.2 SWAN Wave Model

Request: a. Please confirm whether the SWAN model structure in Reference (i) relies on classical (frequentist), Bayesian, or information theoretic statistical modelling.

b. Please provide the current revision history of the SWAN model. This "log file" should include information on temporal updates and changes in statistical algorithms, and show how the model has adapted with advances in statistical modelling design and periodic model testing and evaluation.

c. Please list all statistical analytic tests employed by the SWAN model.

d. Please provide Unified Modelling Language (UML) activity diagrams for all algorithms employed by the SWAN model. The product(s) should indicate flow of work indicating model inputs, actions, and decisions from initial to final state(s).

e. Please provide a list of all peer-reviewed, refereed journal articles that introduce, describe the modelling environment of, attempt to validate with historical data, or provide critical review of the SWAN model.

2.4.3 SPILLCALC Oil Spill Model

Request: a. Please identify if the SPILLCALC model structure relies on classical (frequentist), Bayesian, or information theoretic statistical modelling.

b. Please provide the current revision history of the SPILLCALC model. This "log file" should include information on temporal updates, changes in statistical algorithms, and infer how the model has adapted with advances in statistical modelling design and periodic model testing and evaluation.

c. Please list all statistical analytic tests employed by the SPILLCALC model.

d. Please provide Unified Modelling Language (UML) activity diagrams for all algorithms employed by the SPILLCALC model. The product(s) should indicate flow of work indicating model inputs, actions, and decisions from initial to final state(s).

e. Please provide a list of all peer-reviewed and refereed journal articles that introduce, describe the modelling environment of, attempt to validate with historical data, or provide critical review of the SPILLCALC model.

2.5 Oil Retention on shorelines in SPILLCALC

References: i) A3S4Y5, Volume 8A, Marine Transportation, Section 5.4.4.4.4, PDF page 30 of 43.

Preamble: In Reference (i), the description of the algorithm used to calculate the amount of oil transferred to sediment upon contact with beach and intertidal shoreline indicates that there was no provision to refloat trapped oil. This was deemed likely to over estimate the amount of oil that is stranded.

Request: a. Please confirm that overestimating the amount of oil trapped on or in shorelines would result in an underestimation of oil that would be left on the water surface in later time-steps.

2.6 Discrepancy between modeled and observed results

References: i) A3S5H1, Volume 8C, Modelling the fate and behaviour of marine oil spills for the Trans Mountain Expansion Project, Figure 3.2.3, PDF page 4 of 9.

ii) A3S5G9, Volume 8C, Modelling the fate and behaviour of marine oil spills for the Trans Mountain Expansion Project, Section 3.2.2, PDF page 23 of 72.

Preamble: Figure 3.2.3 in Reference (i) shows observed versus predicted along-channel currents for the H3D model. The bottom panel in this figure shows the difference between the model and observed values, where the discrepancy is near 20% in many instances, lasting for many hours at times. In most cases, the magnitude (either positive or negative) of the predicted current speed is less than the observed. Reference (ii) states that the current meter validation in the Burrard Inlet 125 m grid serves as a proxy to the 1 km model.

Request: a. Please explain how the discrepancy displayed in Figure 3.2.3 might affect the transfer of spilled oil modelled in SPILLCALC from one grid square to the next within the Burrard Inlet 125 m grid.

b. Please confirm that the speed of oil movement as predicted and modeled by SPILLCALC would be necessarily underestimated, and if this is not the case, provide explanation as to why not.

c. Please explain if this type of discrepancy is expected, has been tested for, or has been identified in other areas where spill modeling was completed, given that this current meter validation serves as a proxy to the 1 km grid.

2.7 Sensitivity Analysis

References: i) A3S5G9, Volume 8C, Modelling the fate and behaviour of marine oil spills for the Trans Mountain Expansion Project, Volume 8C TR 12 TR S9, Section 3.1.1, PDF page 19 of 72.

ii) A3S5G9, Volume 8C, Modelling the fate and behaviour of marine oil spills for the Trans Mountain Expansion Project, Section 3.1, PDF page 18 of 72.

Preamble: Reference (i) provides a description of the hydrodynamic grids used in the four model implementations of H3D used by SPILLCALC. Reference (ii) states that "The selection of grid size is based on consideration of the scale of the phenomena of interest, the grid domain, and available computational resources."

Request: a. Please confirm if any sensitivity analysis was done on the grid square size for any of the four grids (Strait of Georgia 1 km grid, Strait of Georgia 200 m grid, Fraser River grid, or Burrard Inlet 125 m grid) used in the H3D simulations. For example, was the 1 km Strait of Georgia grid always run at 1 km or were the grid sizes altered during different model runs to assess the sensitivity of modeled results to grid square size?

b. Please provide the statistical methods used in Reference (ii) to select the grid size in the four model implementations used in H3D.

2.8 Slicklets in SPILLCALC

Reference: i) A3S5G9, Volume 8C, Modelling the fate and behaviour of marine oil spills for the Trans Mountain Expansion Project, Section 5.1, PDF page 26 of 72.

ii) A3S5G9, Volume 8C, Modelling the fate and behaviour of marine oil spills for the Trans Mountain Expansion Project, Section 5.2.7, PDF pages 32 to 36 of 72.

Preamble: Reference (i) describes how oil released on the water is represented by a large number of independent floating particles called "slicklets". Reference (ii) describes the various physical weathering processes that are included within the model SPILLCALC.

Request: a. Please explain why dividing the spilled oil total aliquot into 50,000 identical slicklets is appropriate, given that many of the algorithms for the physical weathering processes listed in Reference (ii) would likely be different for different sized "slicklets".

b. If this is limited by computational resources please indicate that, and confirm that this may not be representative of real-world spills, where the initial oil slick may break up into any number of uniquely sized smaller slicks.

c. Please explain how differing slicklet size may affect each of the weathering process listed in reference (ii).

FIGURES ILLUSTRATING SPILL MODEL OUTCOMES

2.9 Figure Corrections

Reference: i) A3S5G8 - Volume 8C, Modelling the fate and behaviour of marine oil spills for the Trans Mountain Expansion Project, Appendix, Figure FR 1-2, PDF page 1 of 11.

ii) A3S5H0 - Volume 8C, Modelling the fate and behaviour of marine oil spills for the Trans Mountain Expansion Project, Appendix, Figure FR 2-2, PDF page 1 of 11.

iii) A3S5H2 - Volume 8C, Modelling the fate and behaviour of marine oil spills for the Trans Mountain Expansion Project, Appendix, Figure FR 3-2, PDF page 1 of 7.

iv) A3S5H5 - Volume 8C, Modelling the fate and behaviour of marine oil spills for the Trans Mountain Expansion Project, Appendix, Figure FR 4-2.PDF page 6 of 14.

Preamble: Stochastic modeling was completed for spills on the Fraser River. The figures in References (i)-(iv) have layers representing the probability of oil presence. In each of these figures, the 1% line is very difficult to discern and in some cases not visible. It is important that the information be visible.

Request: a. Please provide updates to the figures in References (i)-(iv) listed below where all the layers are clearly visible, or, alternatively, provide the shapefiles for the probability of oil presence in the listed figures: FR 1-2, FR 2-2 both large and small scale, FR 3-2 and FR 4-2.

WORLD-LEADING SPILL RESPONSE

2.10 World Class Oil Spill Response

References: i) A3S4V5 - Application Volume 7, Risk Assessment and Management of Pipeline and Facility Spills, PDF page 65 of 84.

ii) A3SOQ7 - Application Volume 1, Province of BC pipeline conditions, PDF page 103 of 113.

Preamble: Reference (i) refers to Trans Mountain's commitment to meet the Province of British Columbia's conditions for oil pipeline approval, as set out in Reference (ii). Requirement 2 calls for “World-leading marine oil spill response, prevention and recovery systems for B.C.'s coastline and ocean to manage and mitigate the risks and costs of heavy-oil pipelines and shipments.” Requirement 3 demands “World-leading practices for land oil spill prevention, response and recovery systems to manage and mitigate the risks and costs of heavy-oil pipelines.”

Request: Can Trans Mountain confirm whether its understanding of “world-leading” marine oil spill response, recovery and prevention is that it should be based on “credible worst case” spill volumes rather than worst case scenarios?