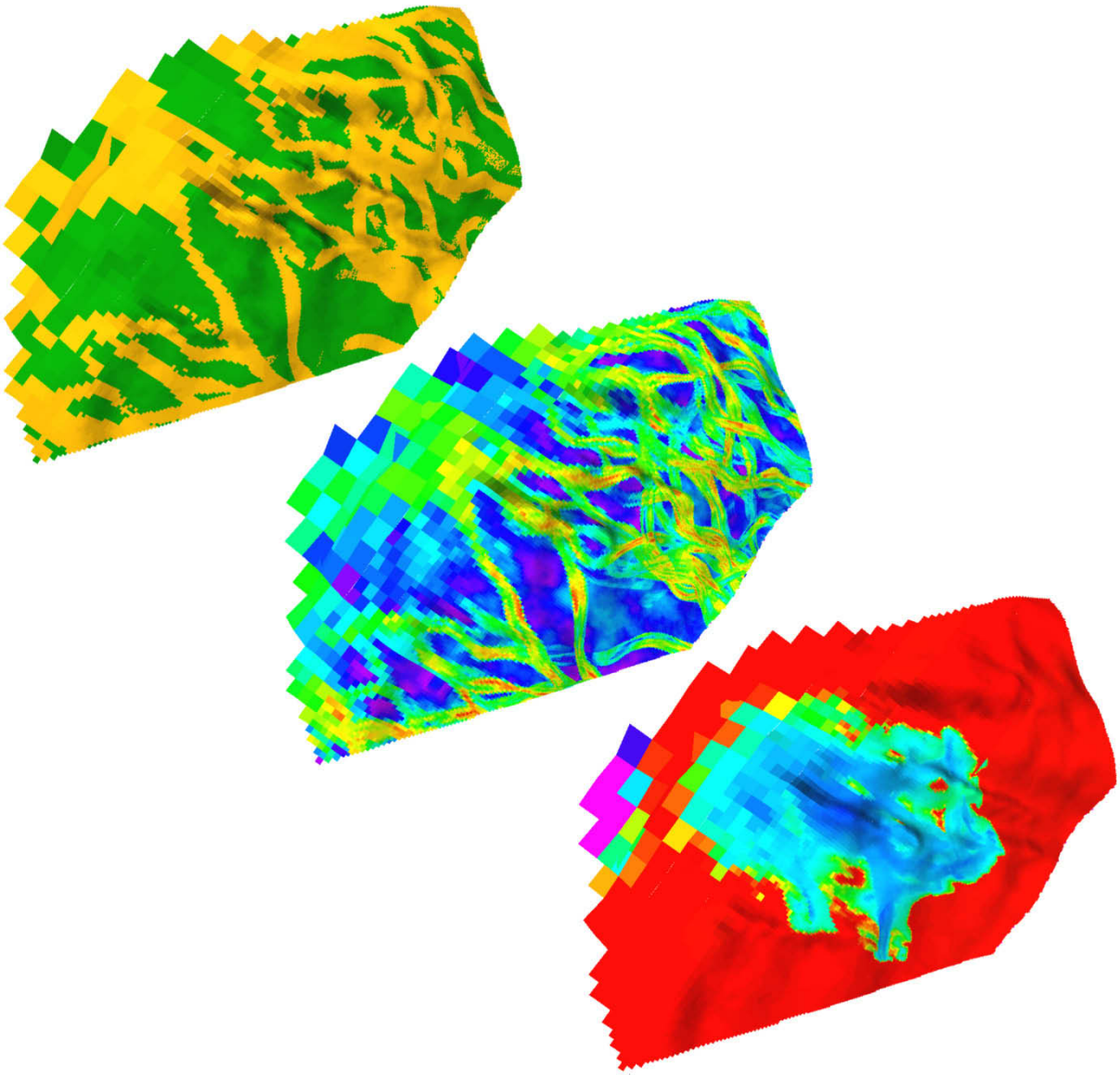
Managing the Interdisciplinary Requirements of 3D Geological Models



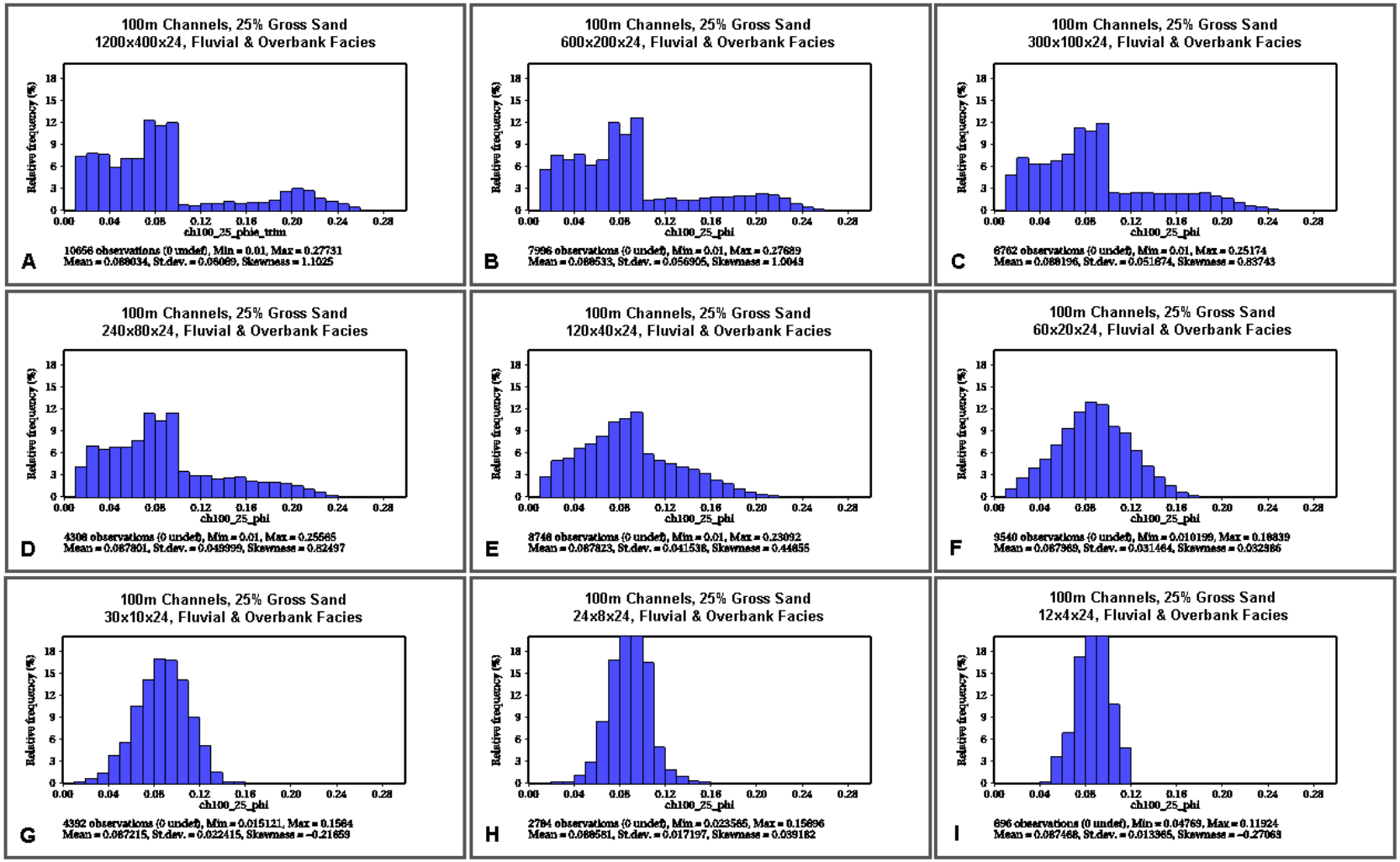
Sarah Jane Riordan
Australian School of Petroleum
University of Adelaide

March 2009

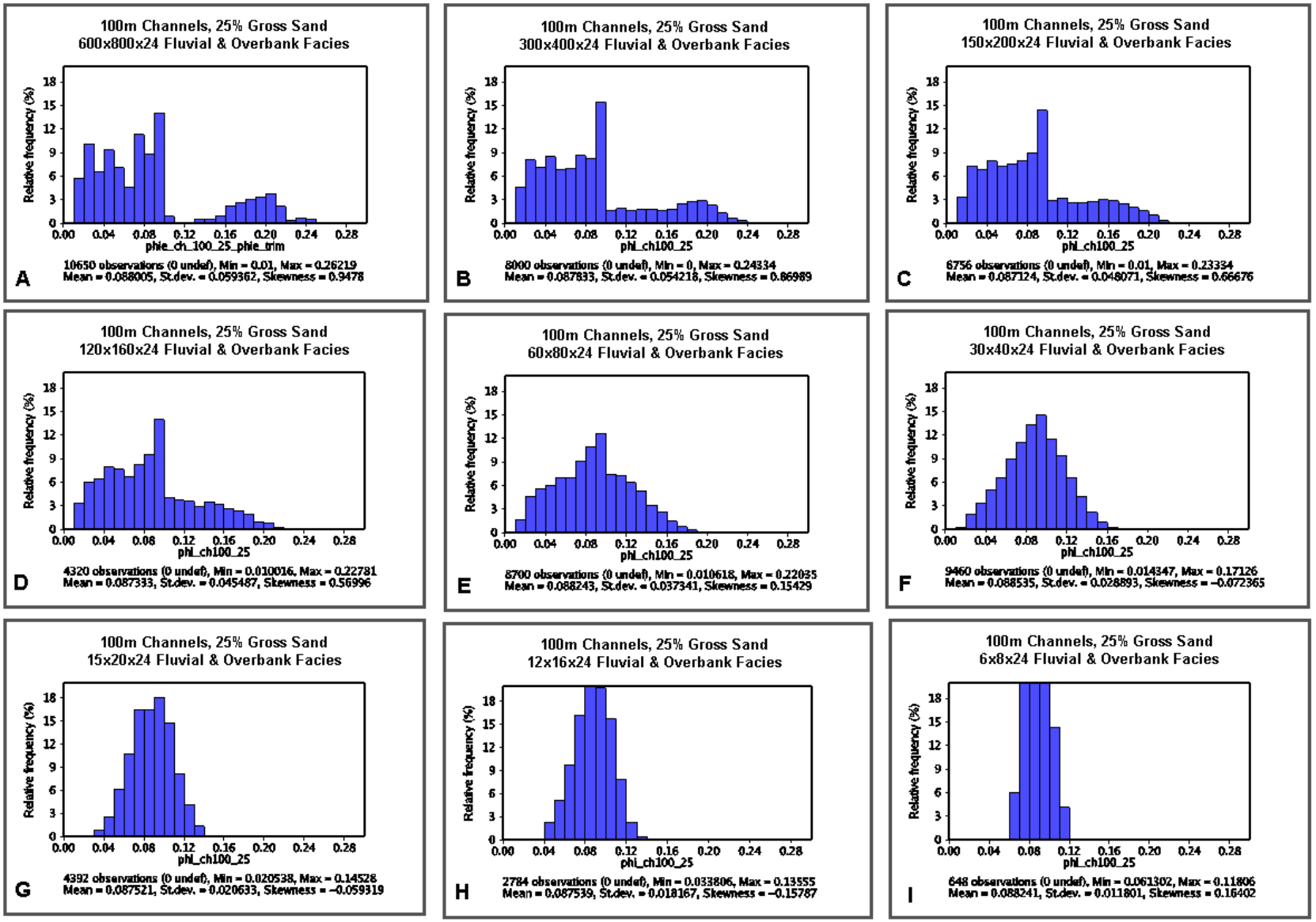
Thesis submitted in accordance with the requirements of the University of Adelaide

for the degree of Doctor in Philosophy

Appendix 3. POROSITY UPSCALING



Appendix 3.1. Histogram of porosity values for the 24 layer SDA100-25 scenario. Cell width exceeds channel width between diagrams D and E. In diagram E the width of the cells is 118m wide.



Appendix 3.2. Histogram of porosity values for SSA100-25 scenario. Cell width exceeds channel width between diagrams C and D. In diagram C the width of the cells is 94m, whilst in diagram D it is 118m. In diagram E the cell width is 235m, which is more than double the width of the channels.

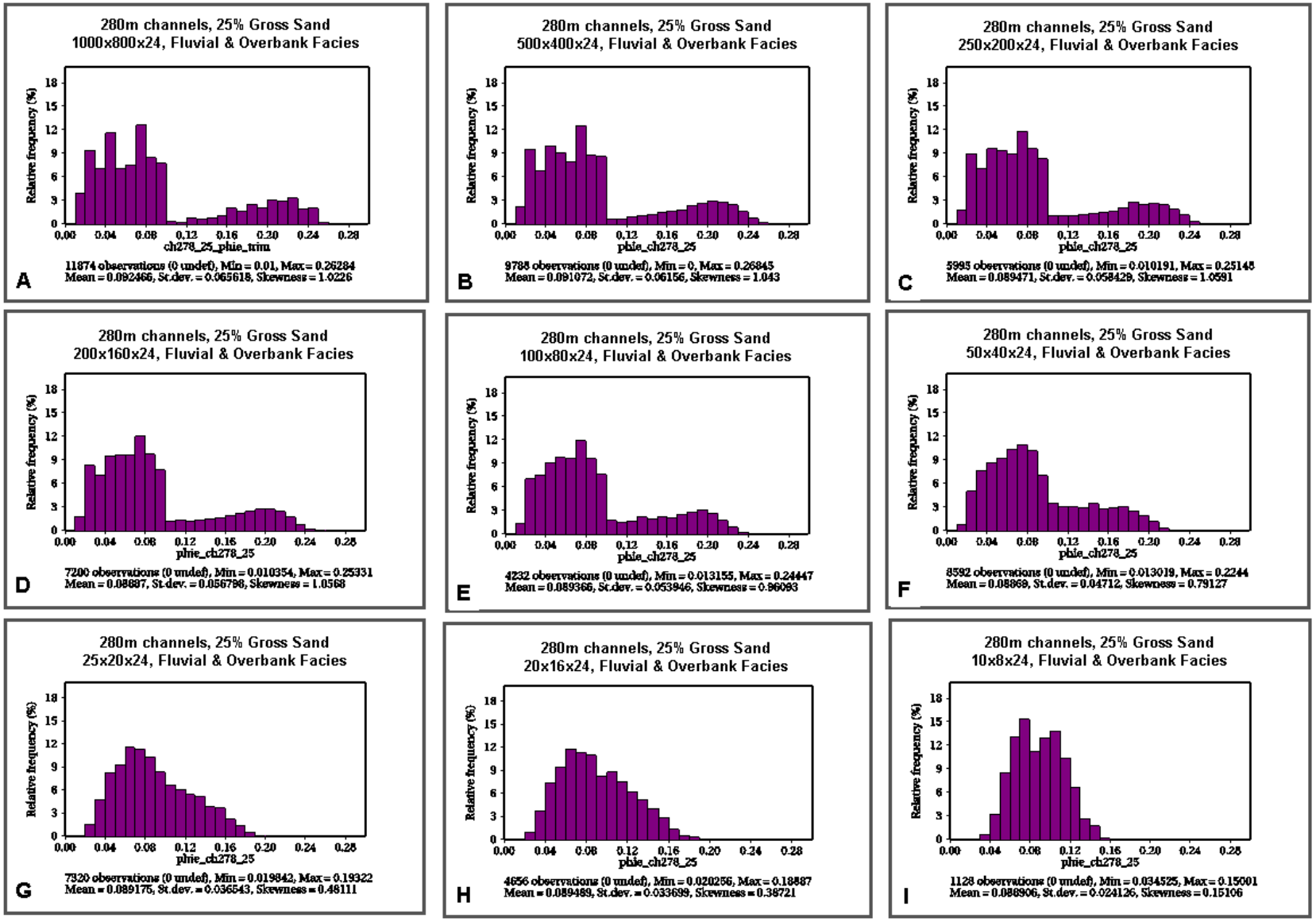


Figure 3.3. Porosity distribution of SQ280-25 scenario, 24 layers. The channel width equals the cell width in diagram F (50 x 40 cells). Like the distribution of the 100 m channels, 50% gross sand scenario (Figure 5.19), the distribution reflects the increased high porosity sand content, but stills shows the tendency of the distribution to tend towards a normal distribution once the channel width is exceeded by the cell width.

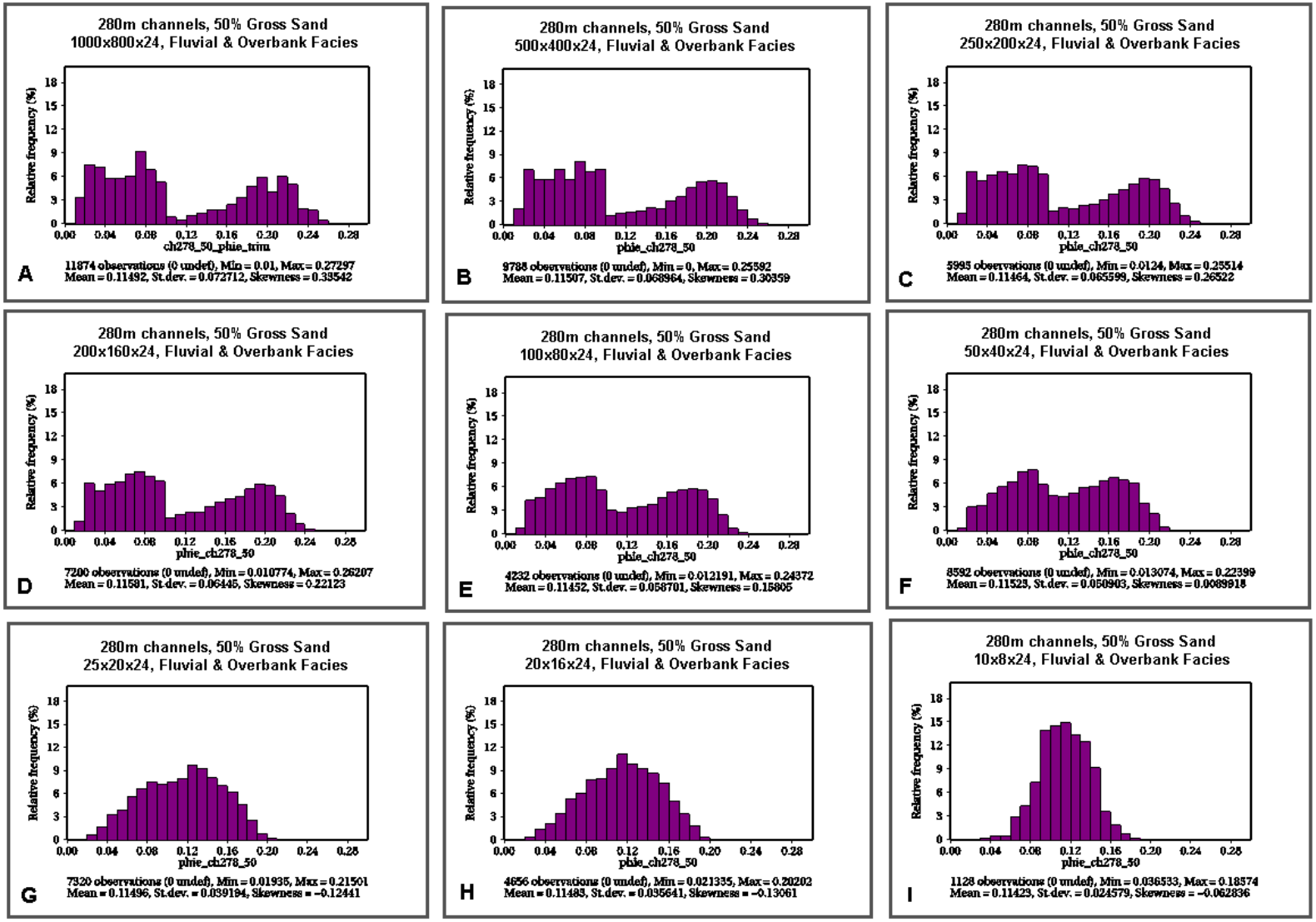
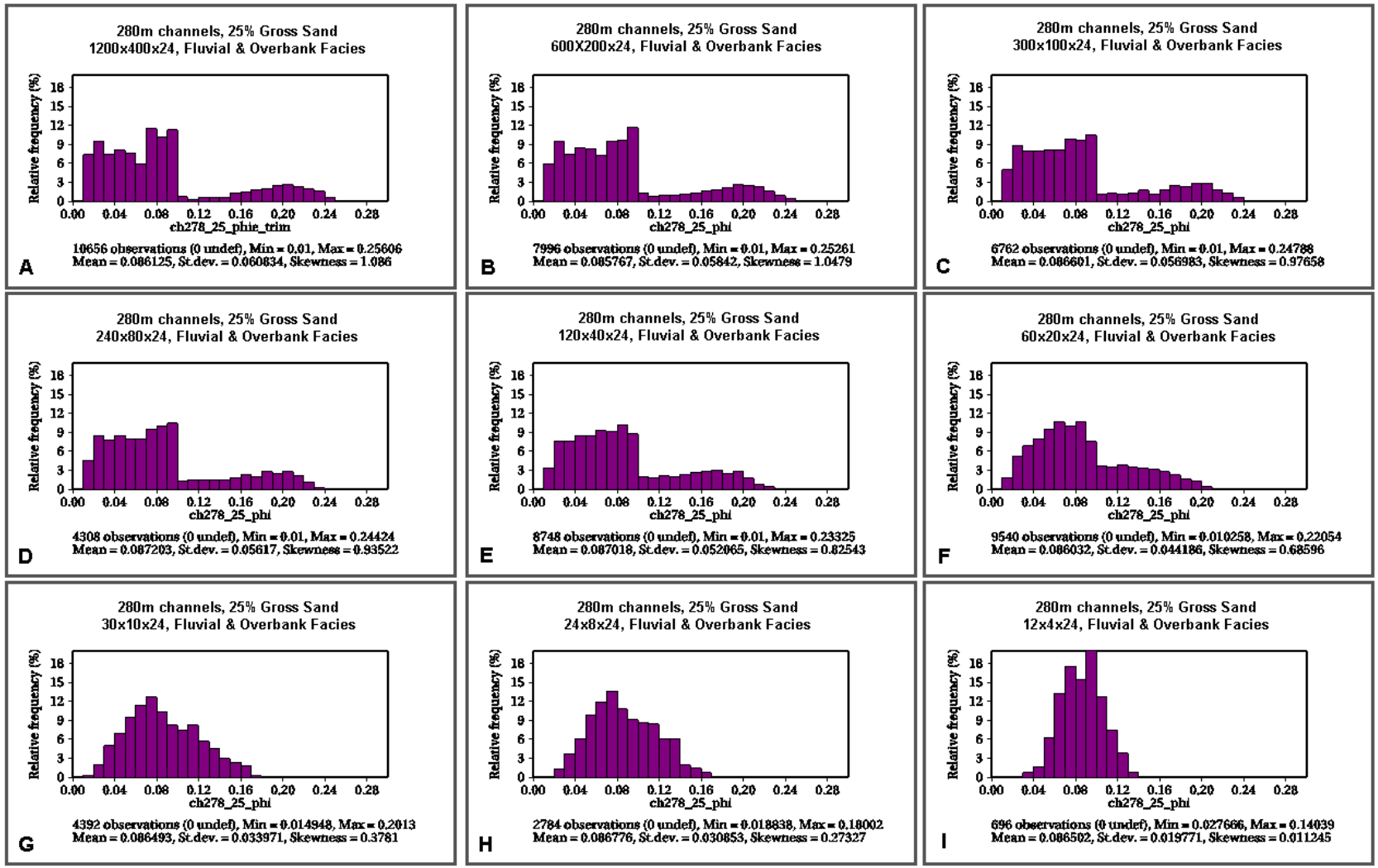
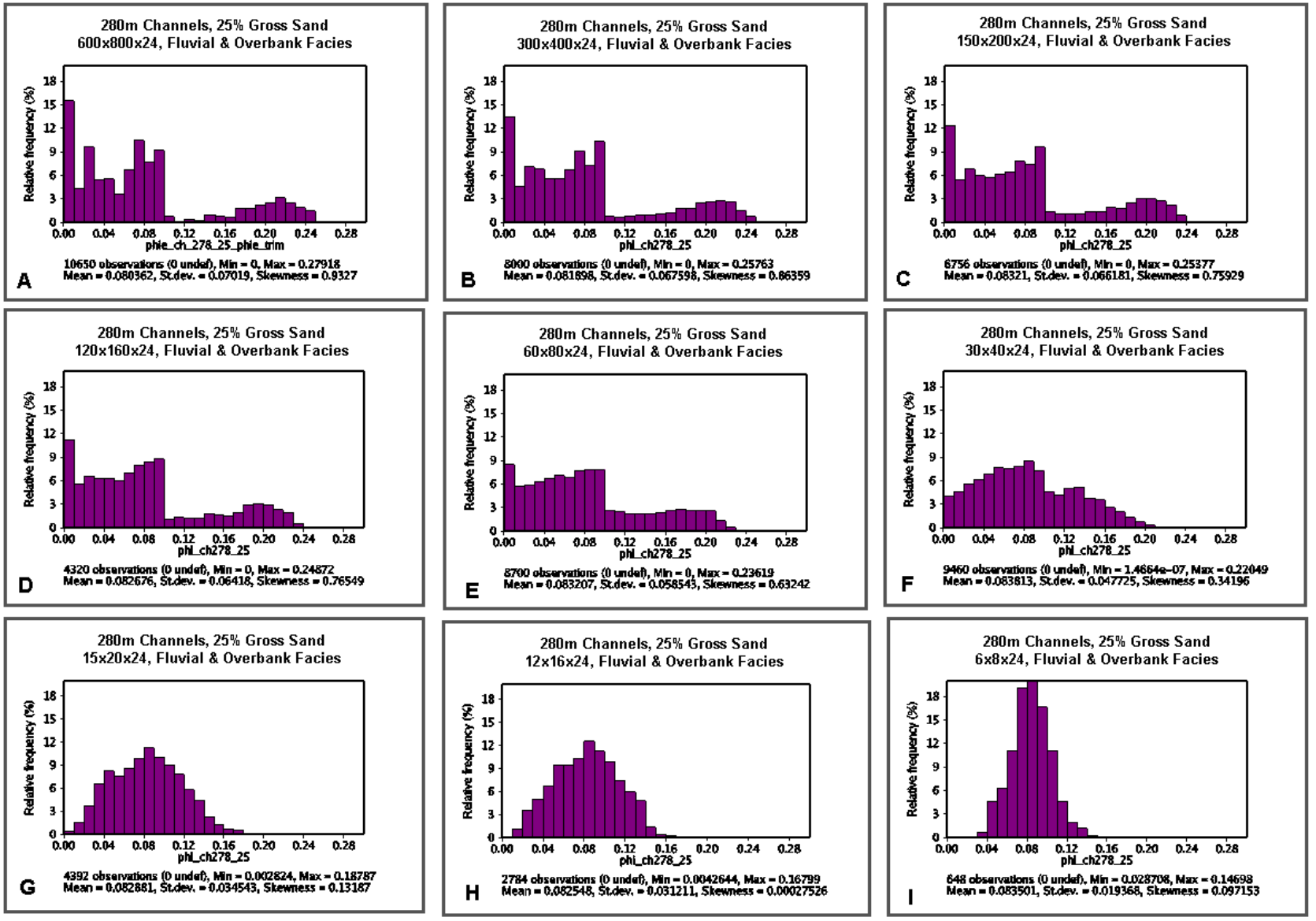


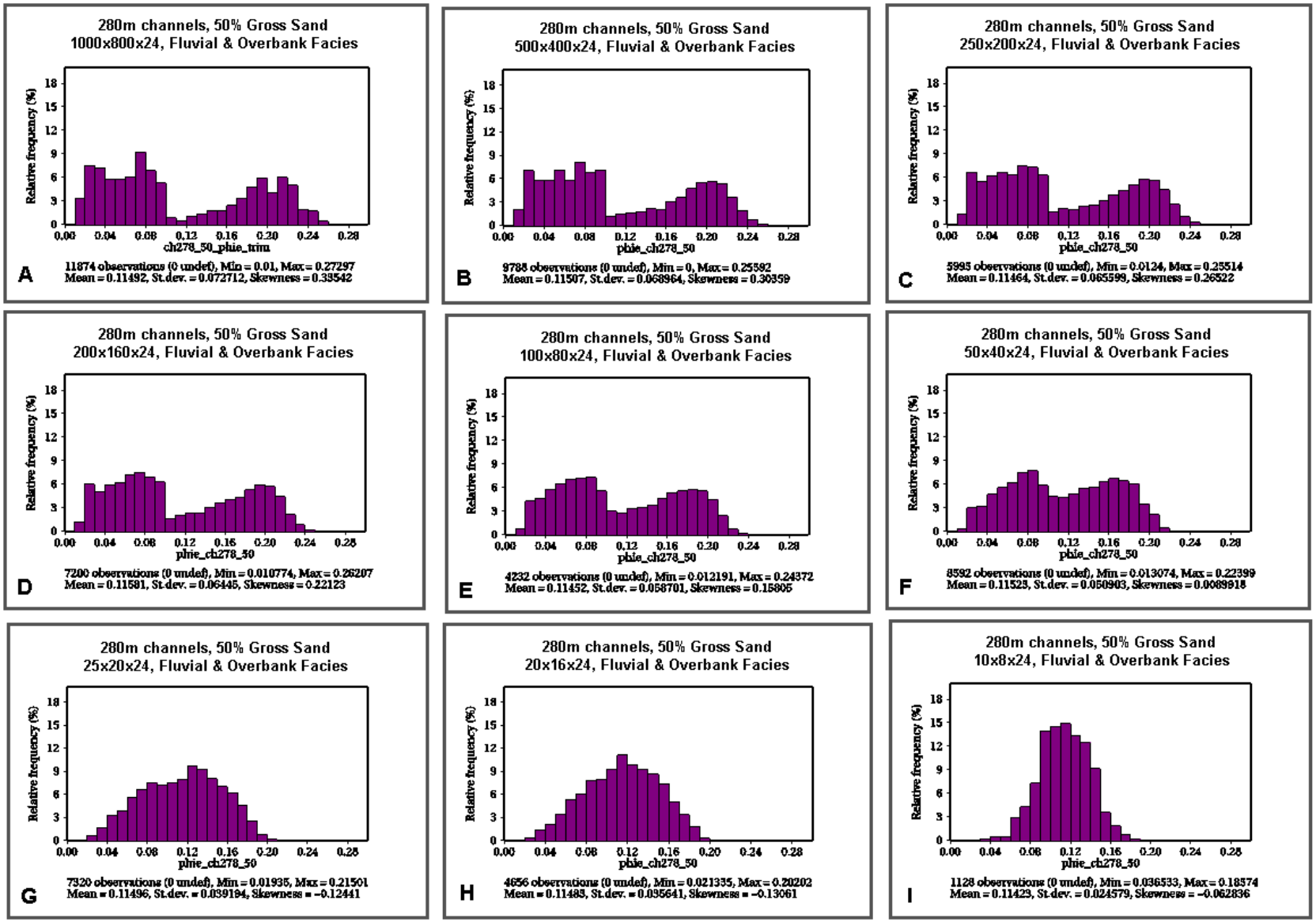
Figure 3.4. Porosity distribution, SQ280-50 scenario, 24 layers. The width of the channels equal the cell width in diagram F. The trends in porosity distribution are the same as those seen in the scenarios with 25%.



Appendix 3.5 Porosity distribution of SDA 280-25 scenario, 24 layers. The channel width is exceeded by the cell width in diagram G (30 x 10 cells). The cell width in this grid is nearly double the channel width. Grids with cells significantly narrower than the channel width (A to E) all have relatively similar porosity distributions.

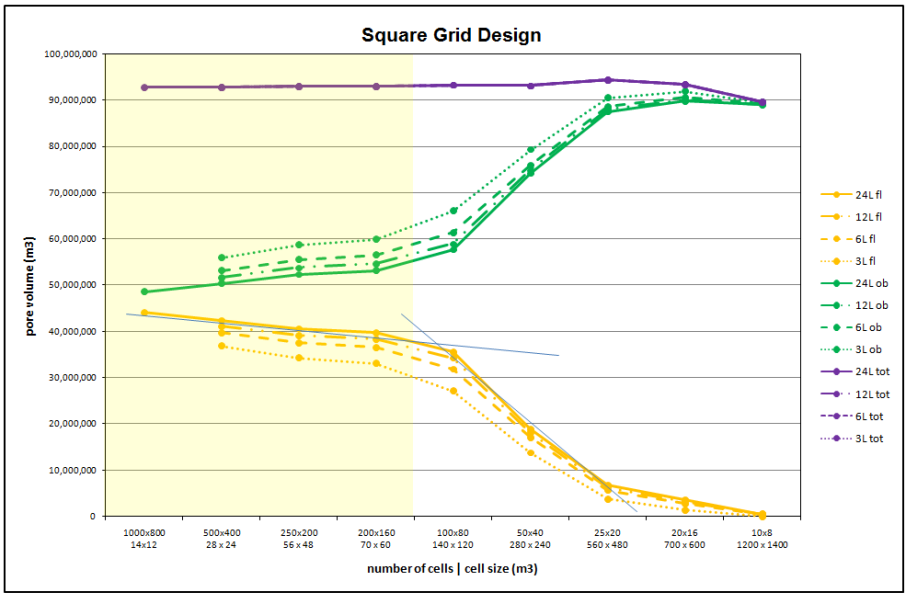


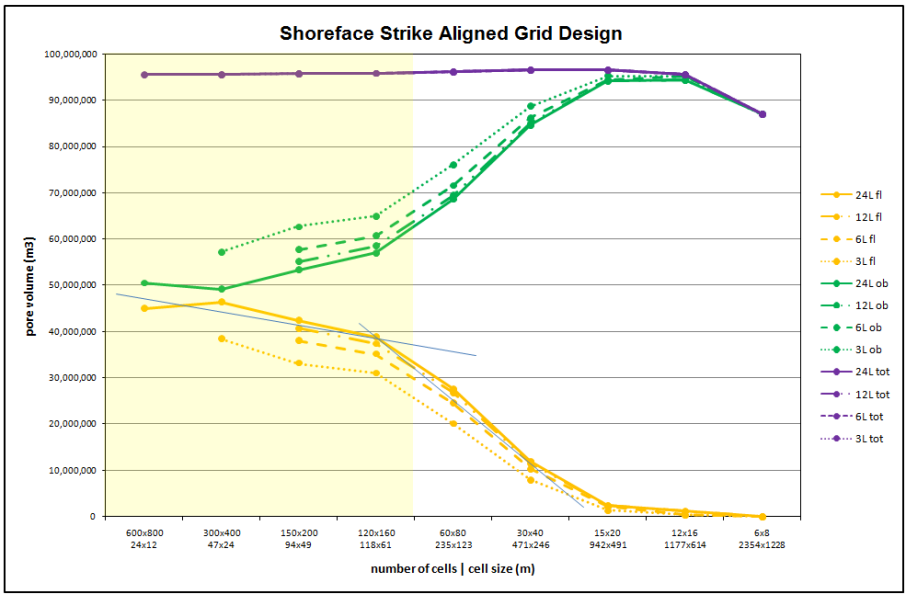
Appendix 3.6. Porosity distribution of SSA280-25 scenario, 24 layers. The cell width becomes greater than the channel width between diagrams E and F.

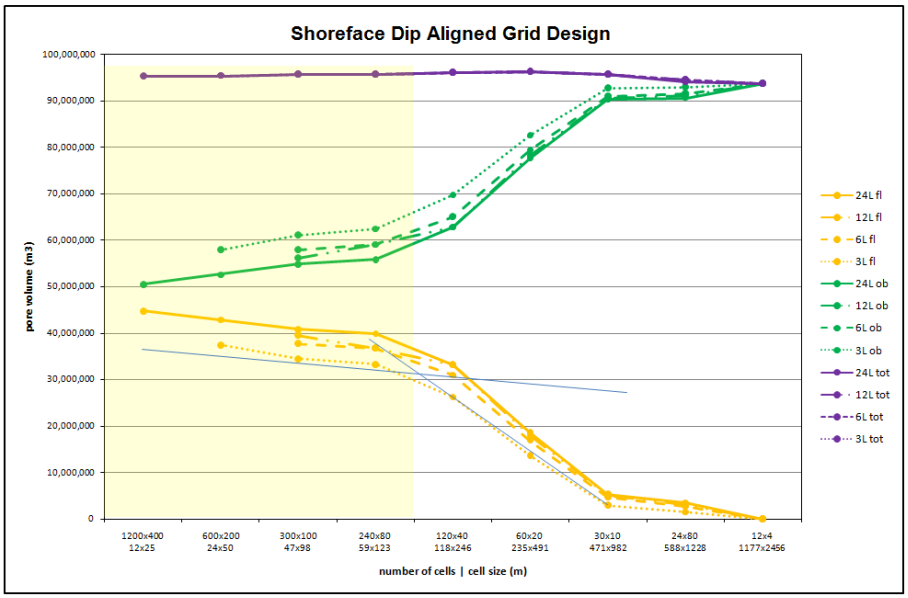


Appendix 3.7. Porosity distribution of SQ 280-50 scenario, 24 layers.

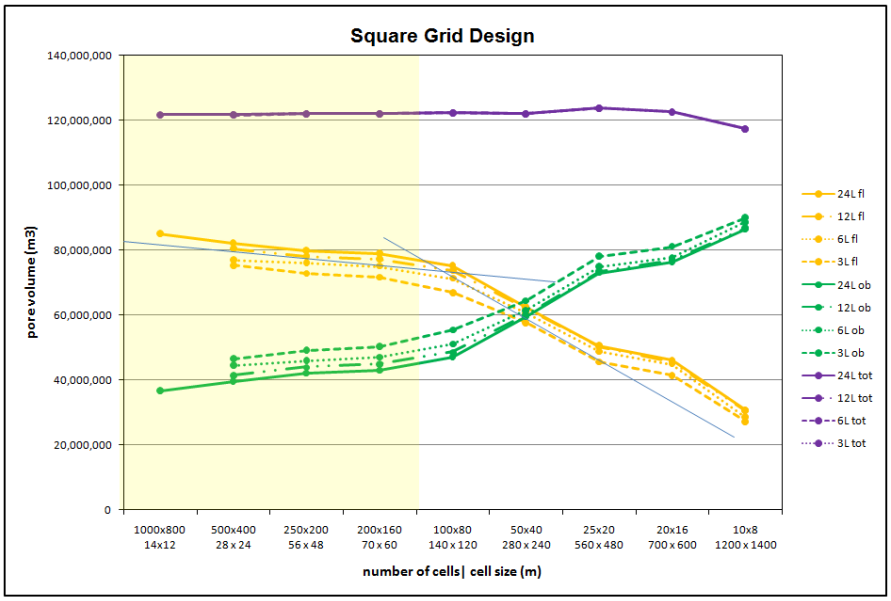
Appendix 4. PORE VOLUMES

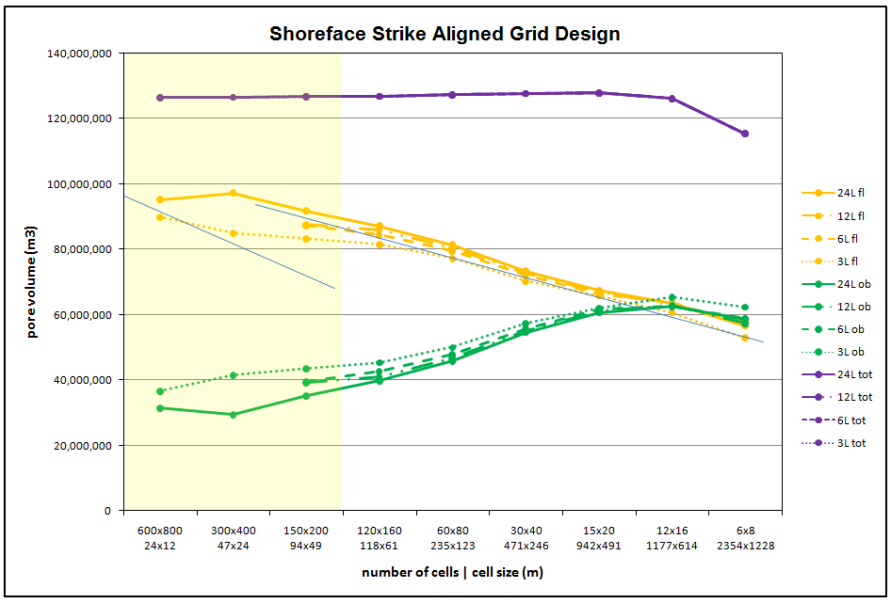


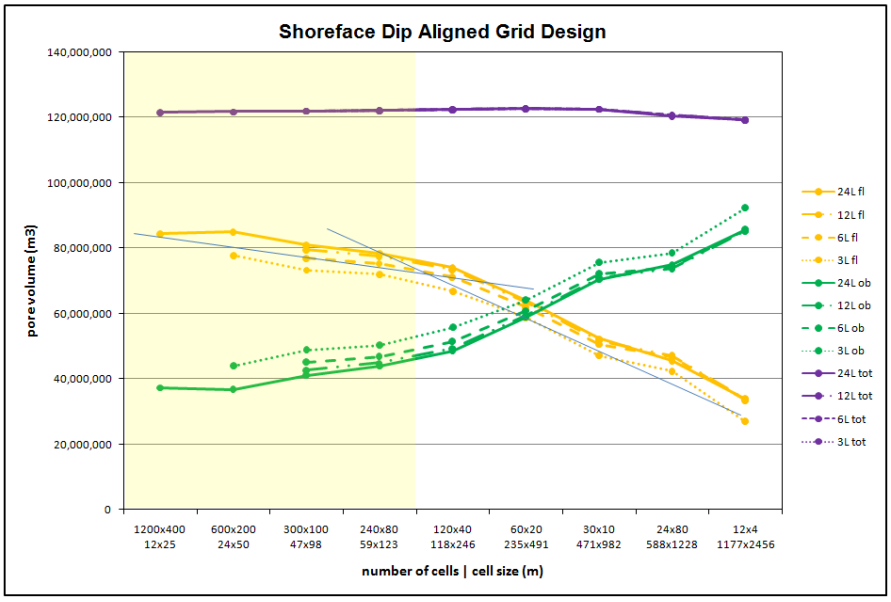




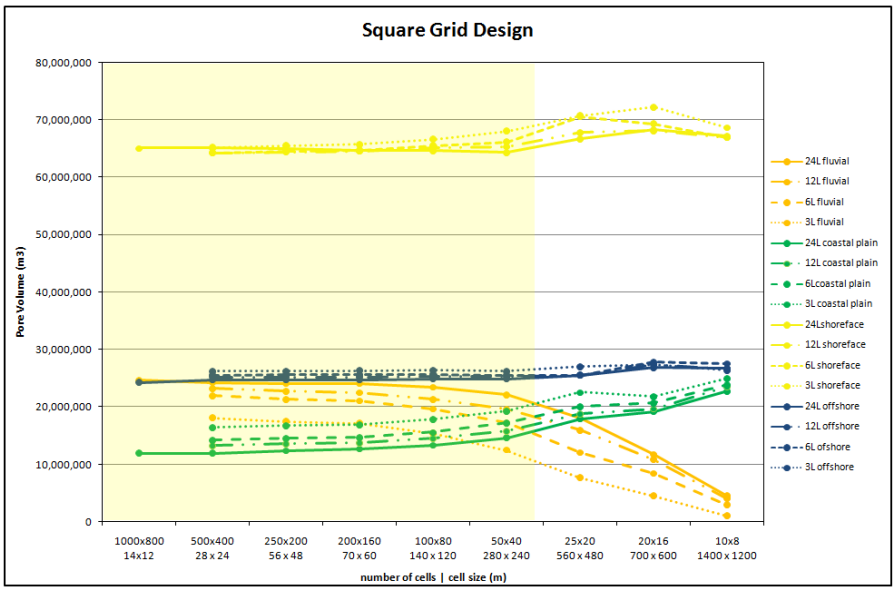
Appendix 4.1. Pore volume by facies. 100-25 scenario- all grid designs. Realizations 1-3. The yellow tint highlights the grids that have cell sizes smaller than the width of the channels. There is a dramatic shift in the distribution of pore volume from fluvial to overbank facies once the width of the grid cells exceeds the channel width.

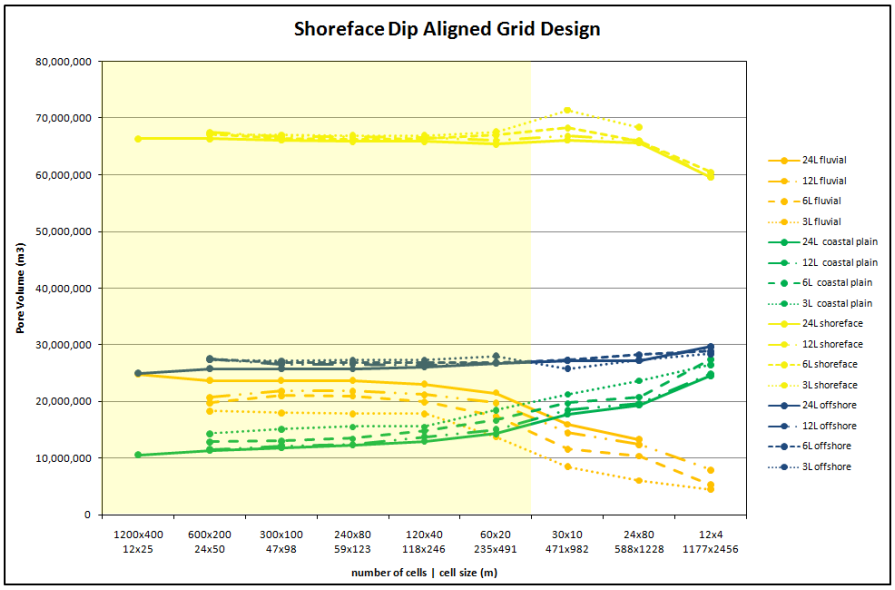


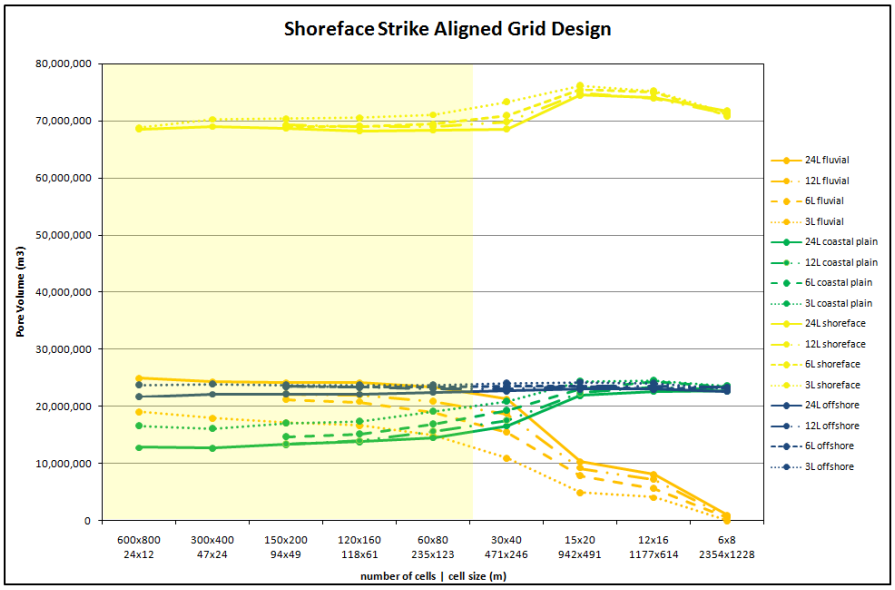




Appendix 4.2. Pore volume by facies. 100-50 scenario- all grid designs. The yellow tint highlights the grids that have cell sizes smaller than the width of the channels. All grid designs show a significant change in rate of change of pore volume as the grids are upscaled once the cell size exceeds the channel width (100 m).

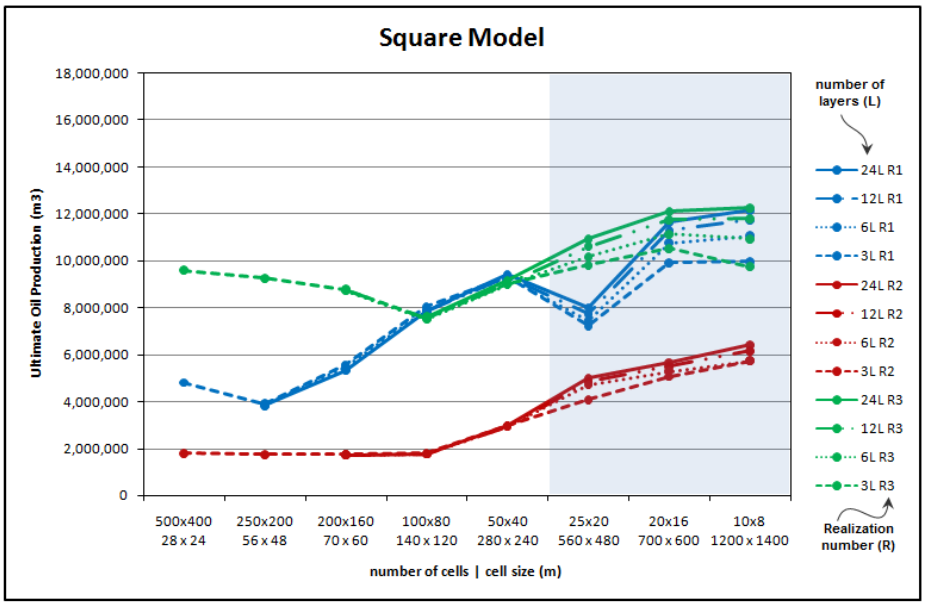


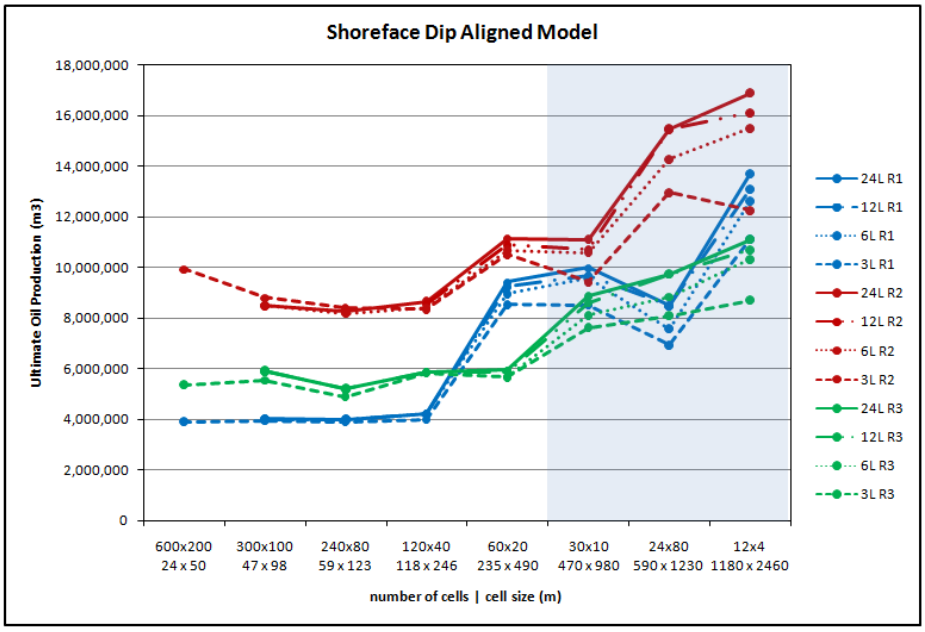


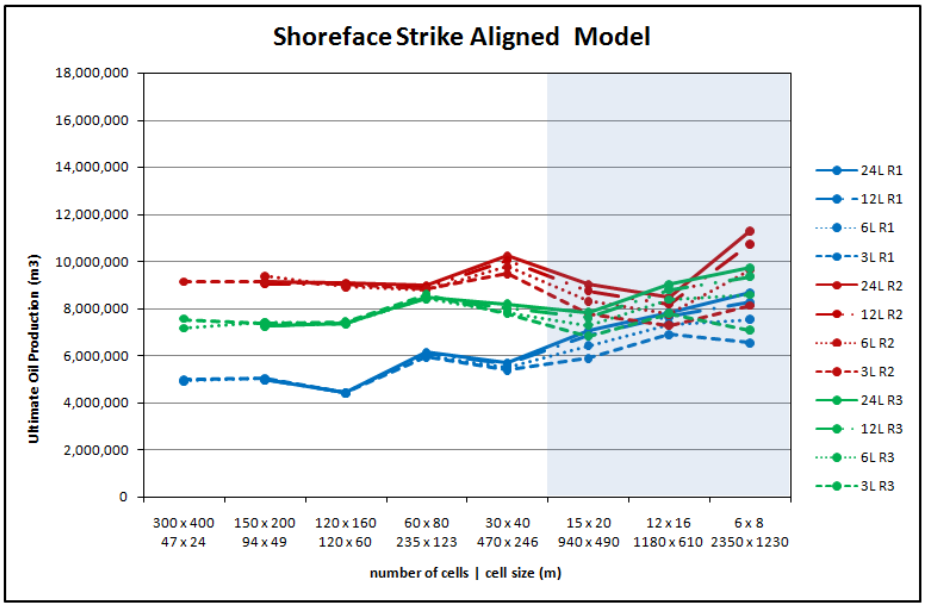


Appendix 4.3. Coast scenario. A comparison of grid designs and the changes to the average pore volumes associated with facies caused by vertical and horizontal upscaling. The yellow shading highlights the grids that have cell widths (x-direction) narrower than the channel width. In all models the pore volume associated with the channel facies is mainly redistributed into the coastal plain facies, with a lesser amount redistributed into the shoreface facies. The SSA grid differs from the square and SDA grid in that the redistribution of pore volume associated with the fluvial facies does not change significantly as soon as the cell width exceeds the channel width. This appears to be specific to the 'coast' scenario. In the 280 m channel scenario, the redistribution occurs when the channel width is exceeded by the cell width (Figure 5.39).

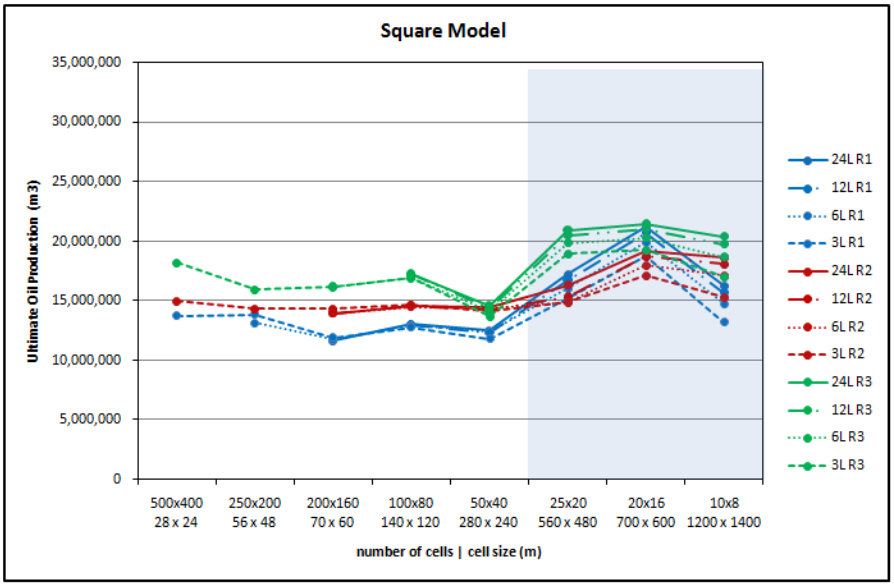
Appendix 5. DYNAMIC MODEL UPSCALING

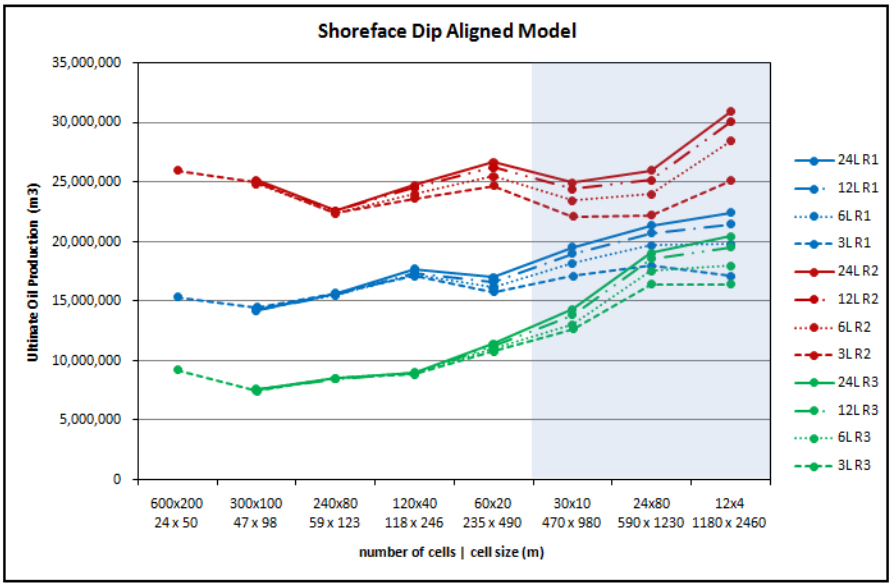


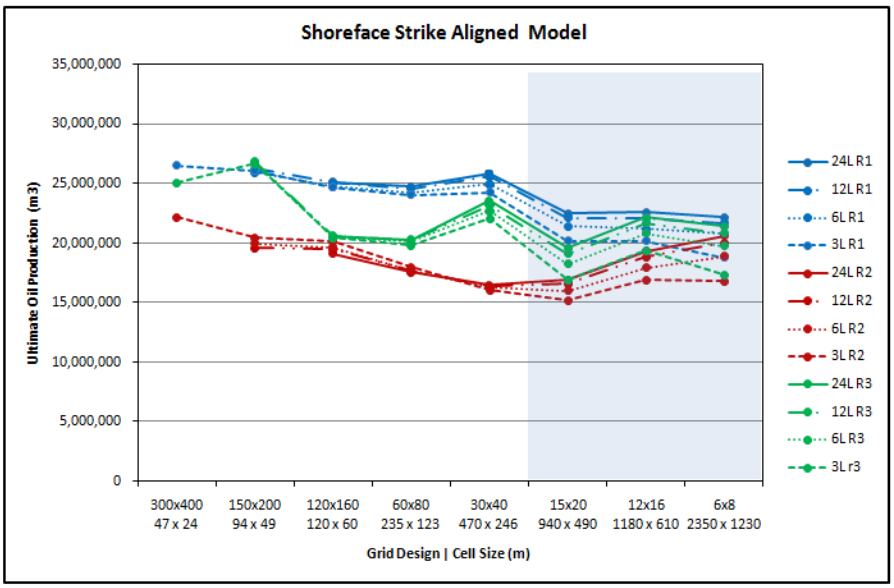




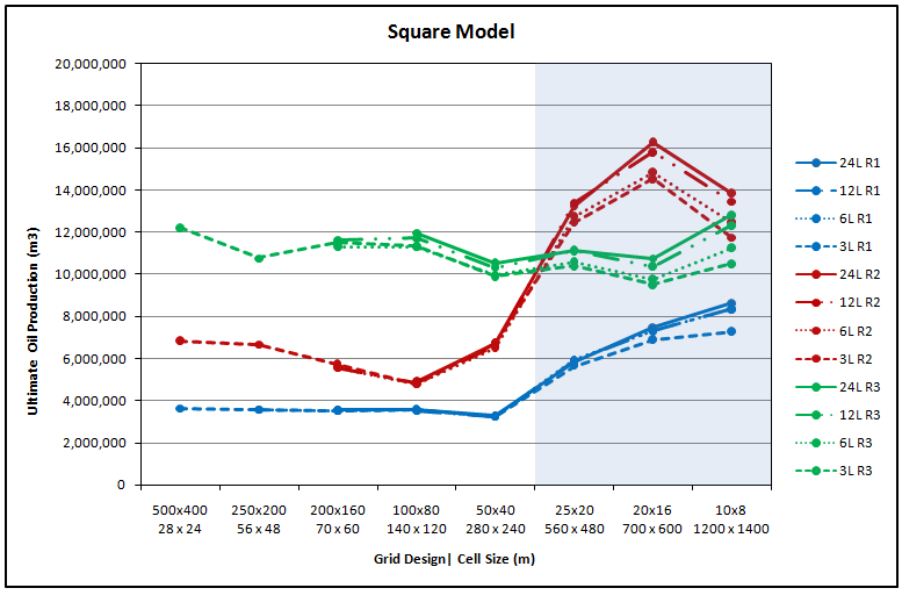
Appendix 5.1. Vertical and horizontal upscaling of the 100-25 scenario, all grid designs.

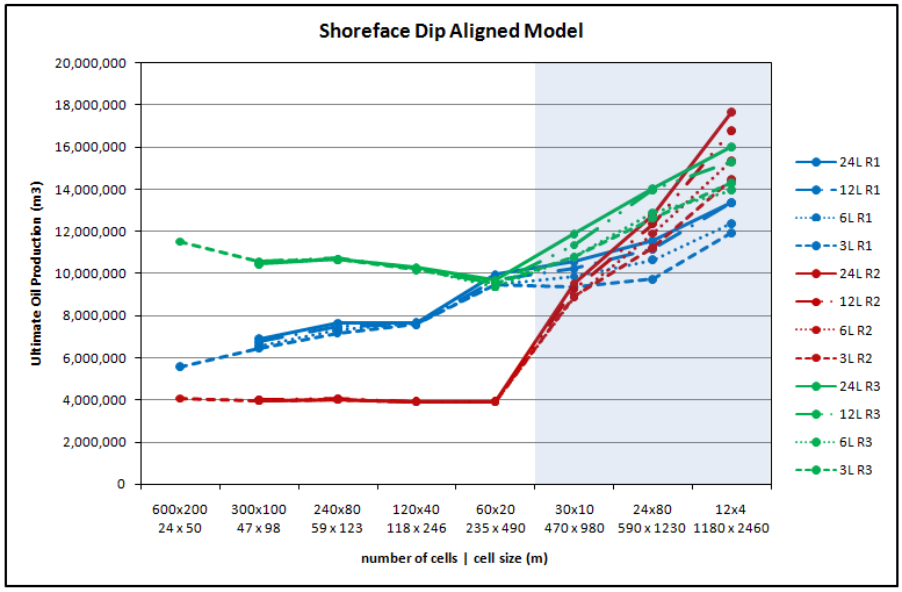


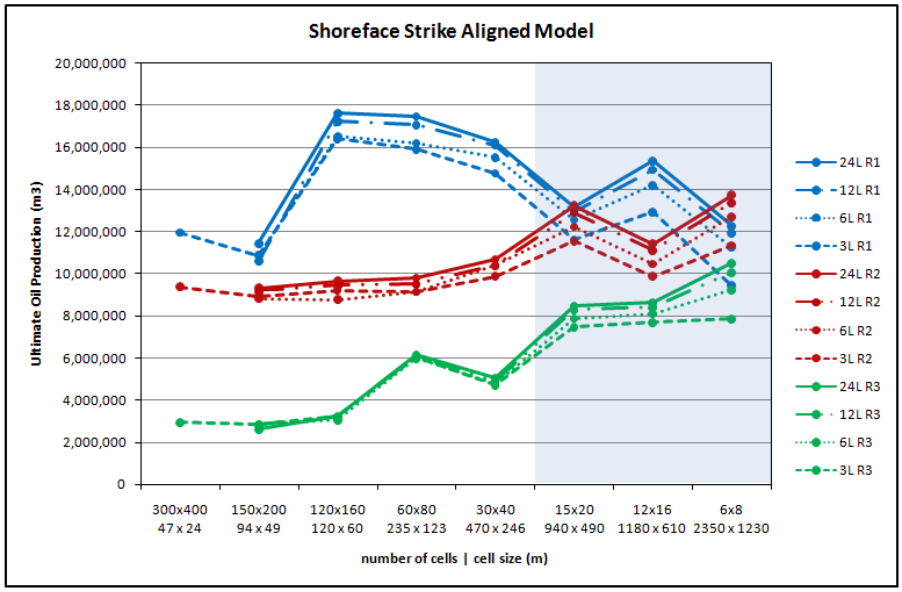




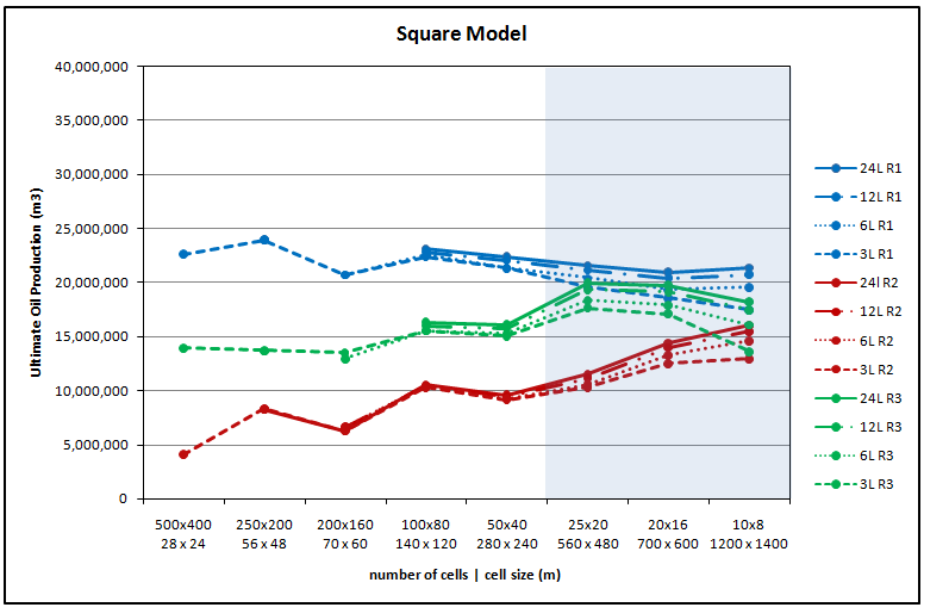
Appendix 5.2. Vertical and horizontal upscaling of the 100-50 scenario, all grid designs.

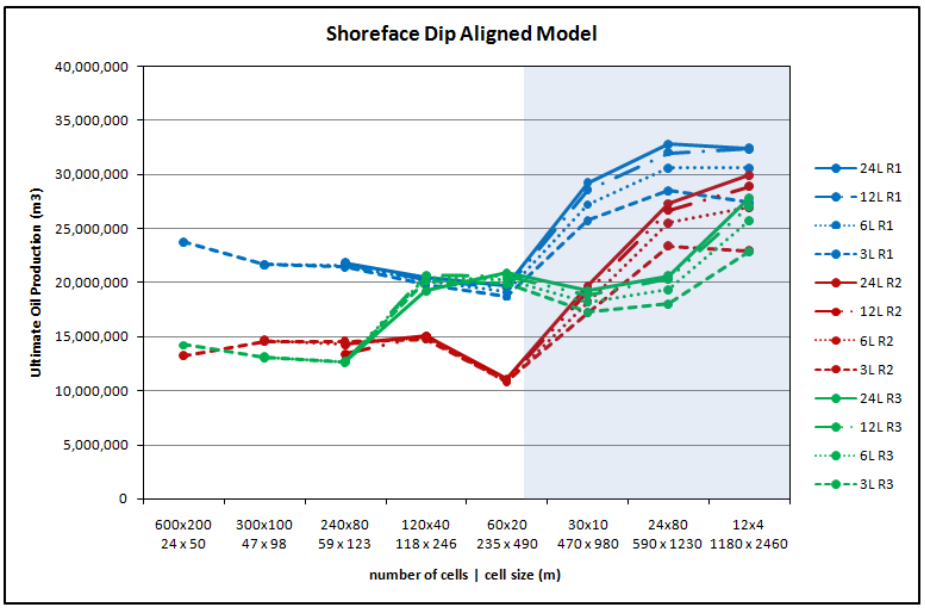


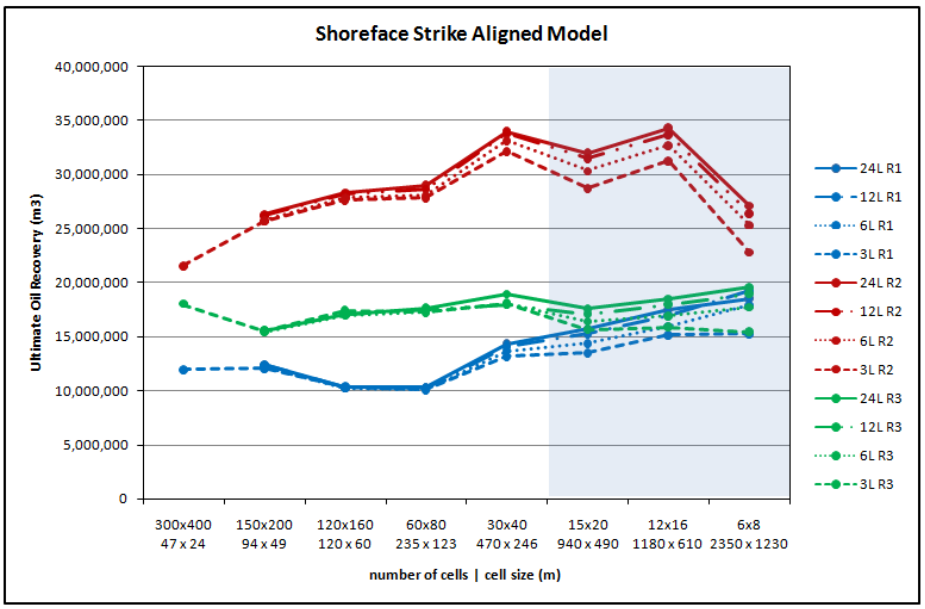




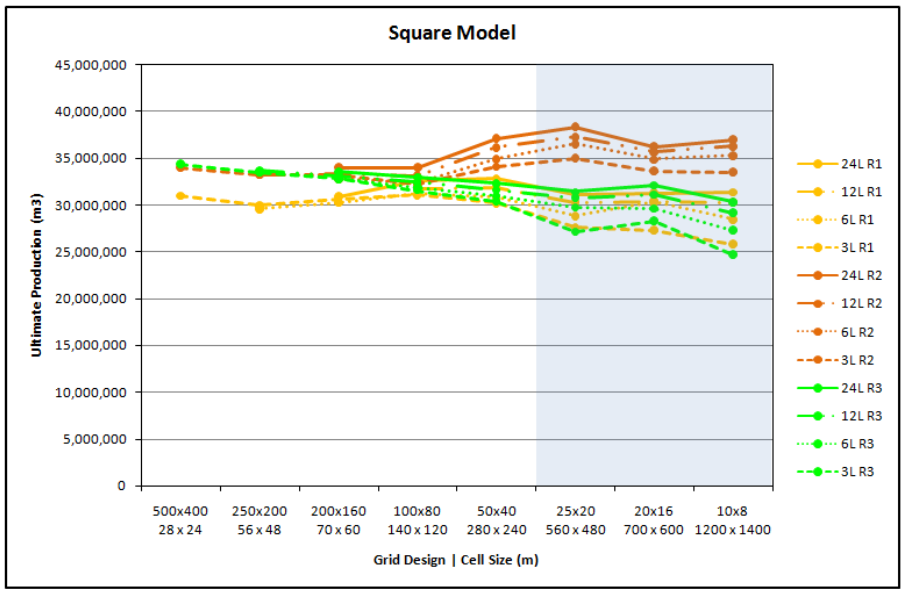
Appendix 5.3. Vertical and horizontal upscaling of the 280-25 scenario, all grid designs

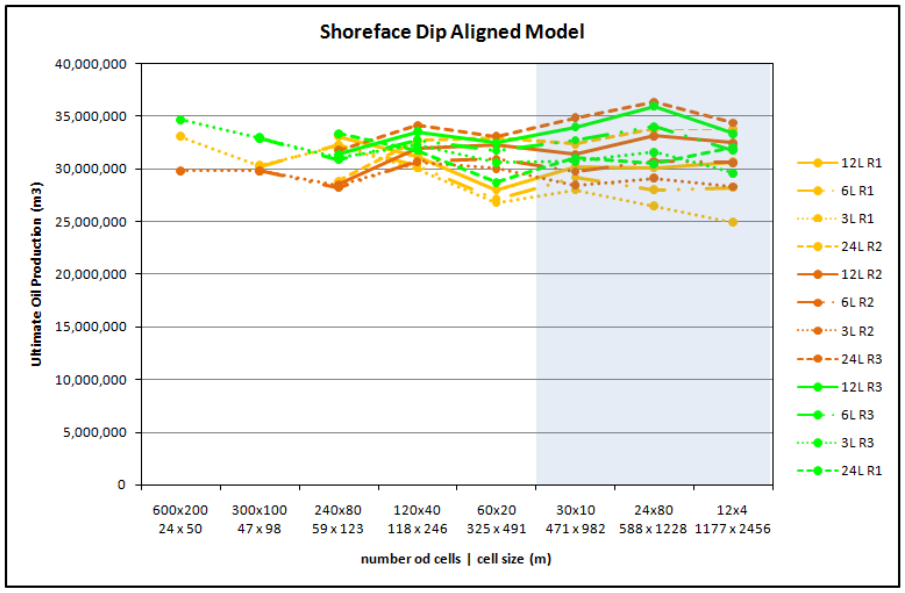


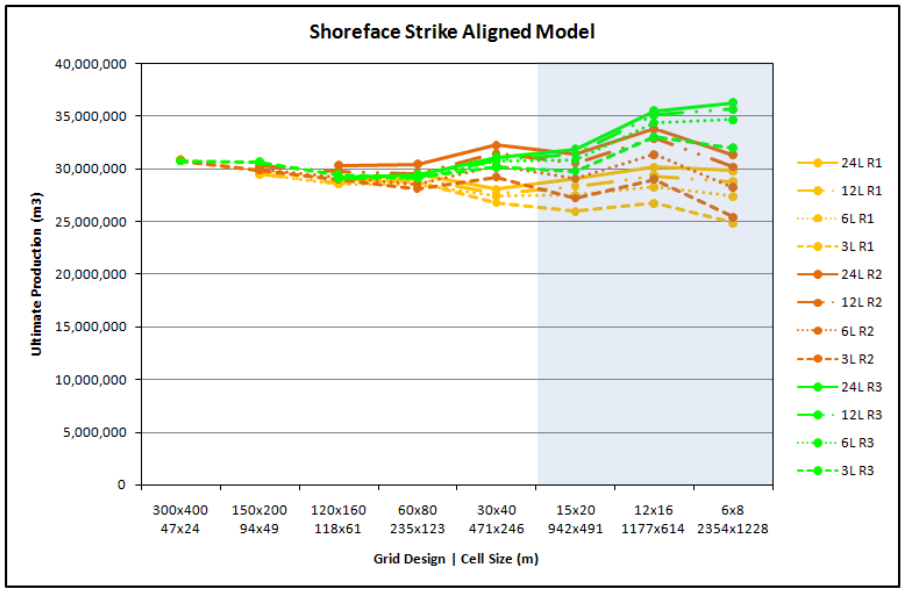




Appendix 5.4. Vertical and horizontal upscaling of the 280-50 scenario, all grid designs.







Appendix 5.5 Vertical and horizontal upscaling of the Coast scenario, all grid designs.