Application of Coupled CFD & DEM Analysis to the design of Bulk Material Transfers

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Presentation Overview

- Numerical methods
- Example project
- Application
- Analysis

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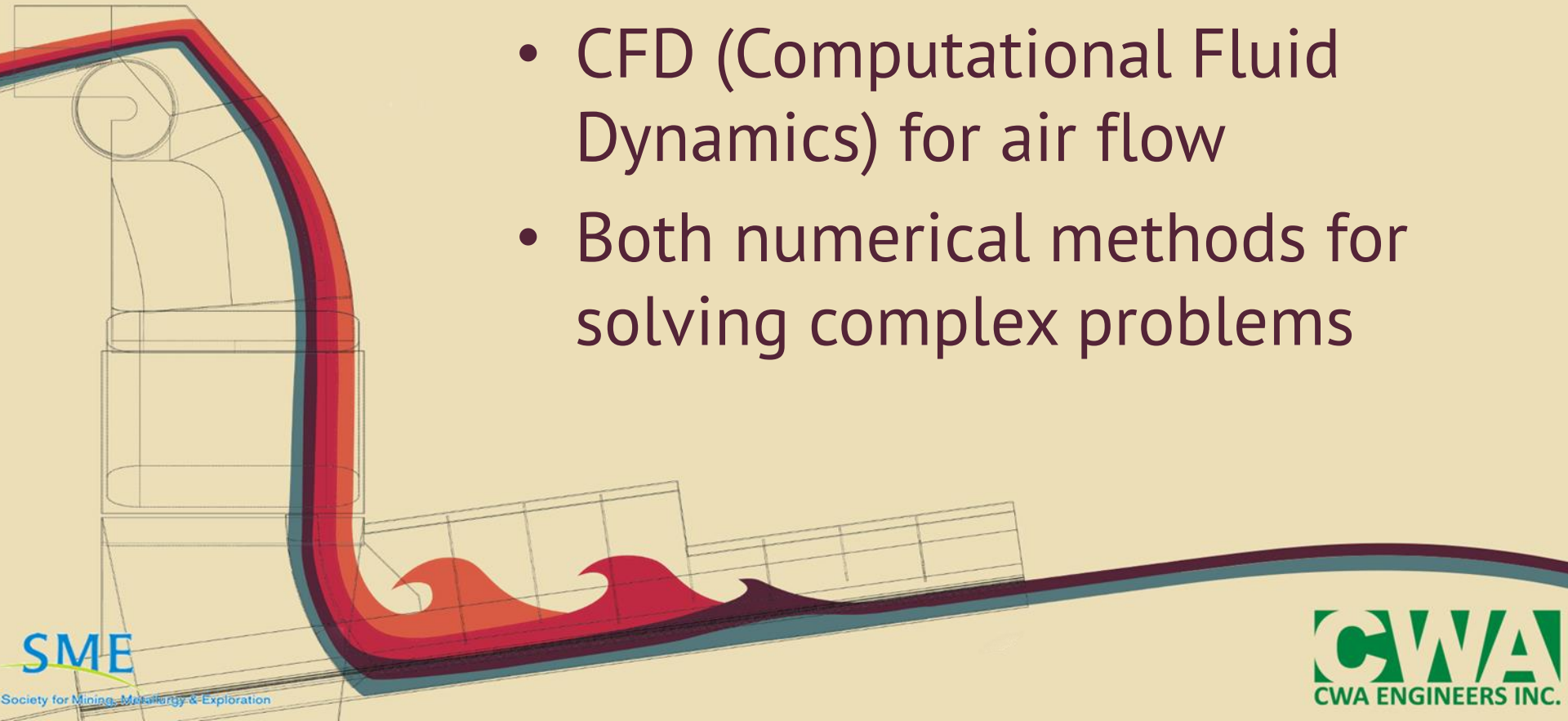
Numerical Methods

- DEM (Discrete Element Method) for bulk material flow
- CFD (Computational Fluid Dynamics) for air flow
- Both numerical methods for solving complex problems



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Software - DEM

- LIGGGHTS
- Originated at JKU Linz, Austria
- Main developer is DCS Computing
- Currently offer free public (open-source) and premium versions

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Software - CFD

- OpenFOAM
- Developed by a community from around the world
- Open source
- www.openfoam.org

Software - Coupling

- CFDEM
- Originated at JKU Linz, Austria
- Main developer is DCS Computing
- Currently offer free public (open-source) and premium versions

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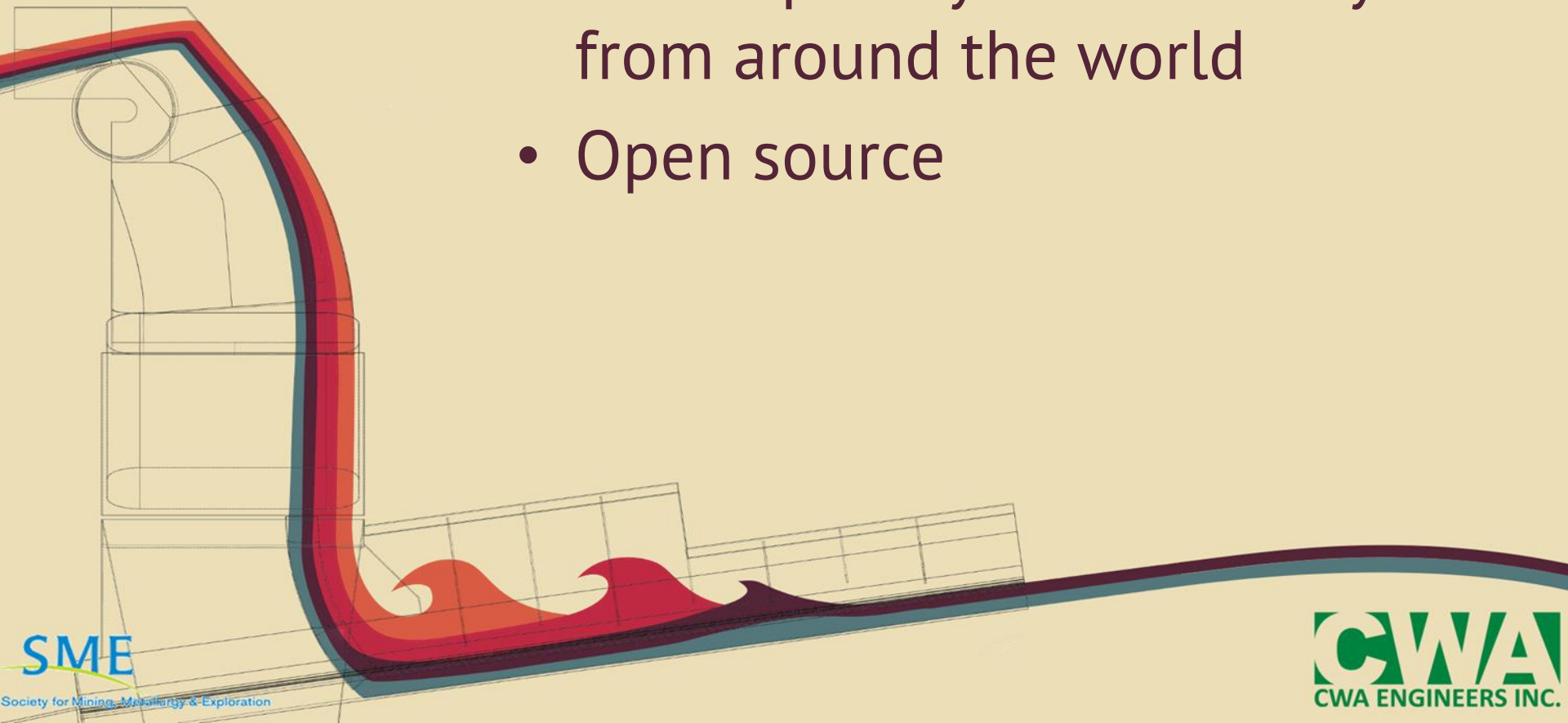
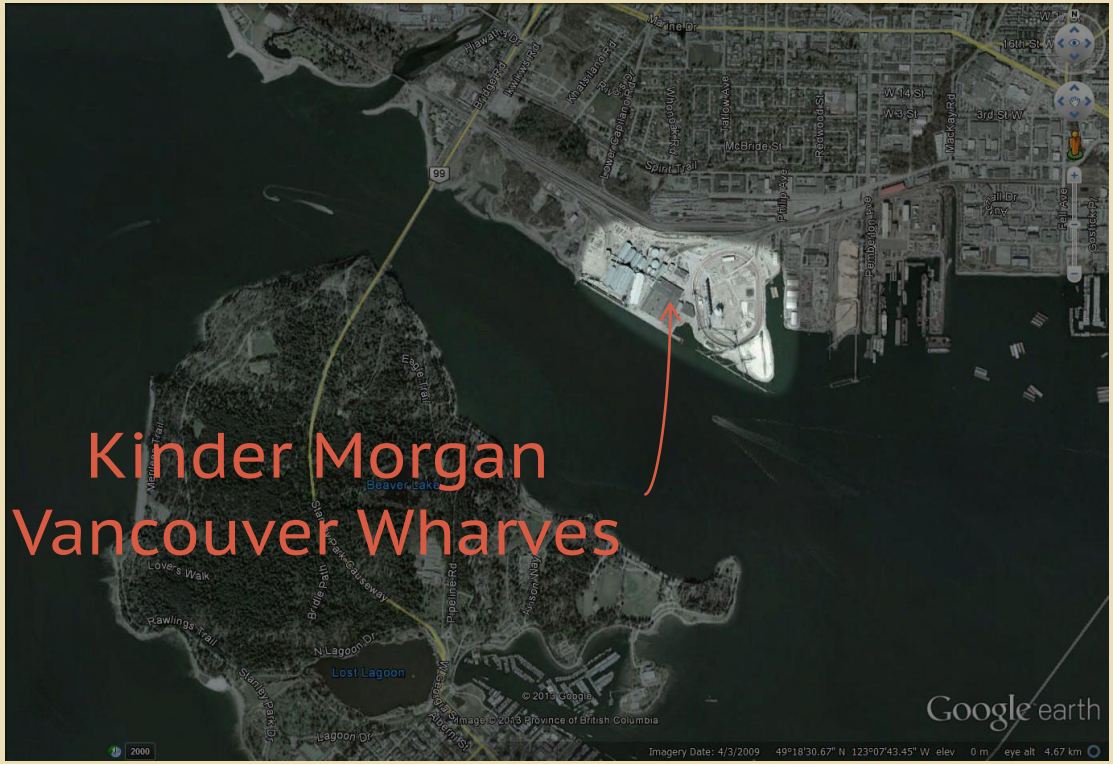
Software – Postprocessing

- ParaView
- Developed by a community from around the world
- Open source



Project Background



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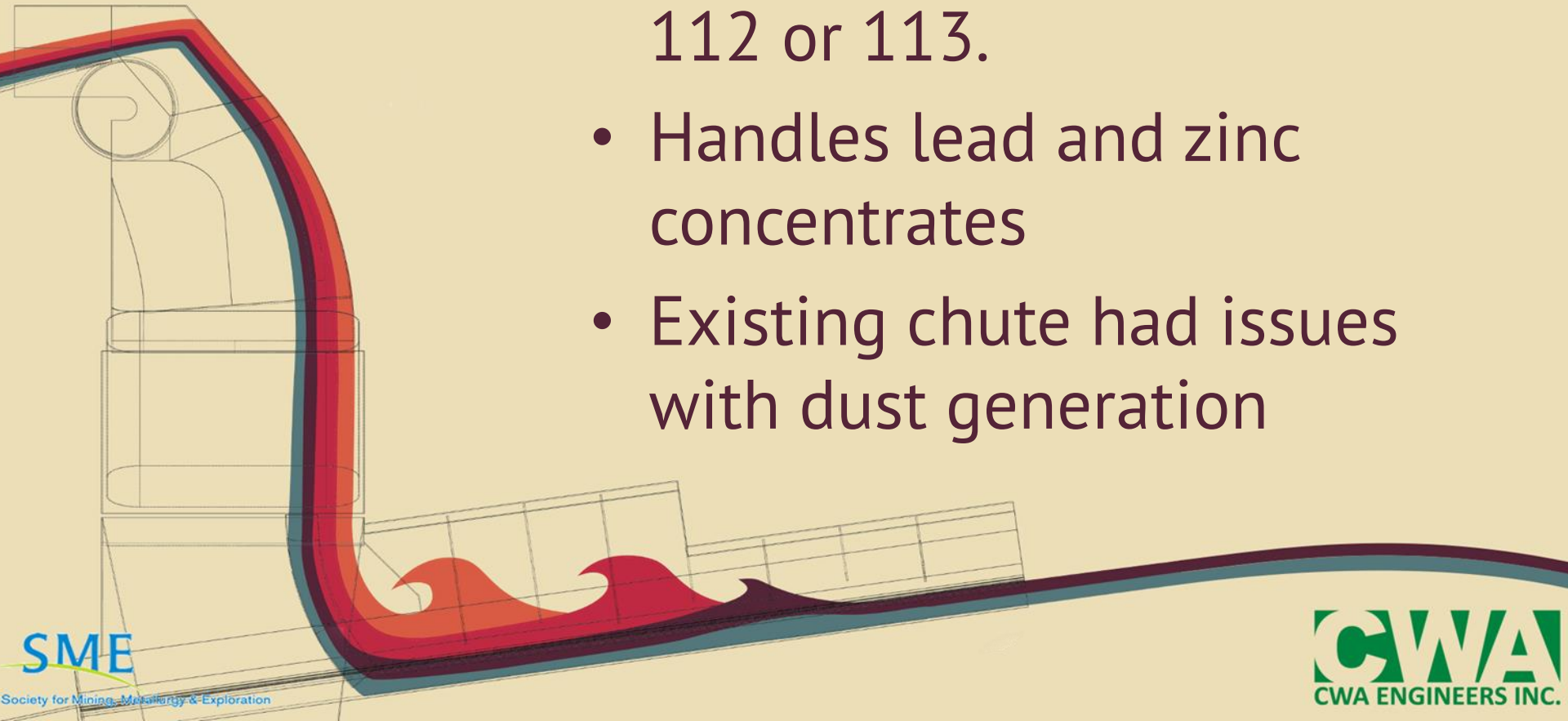
Project Background

- Transfer chute between conveyor 111 and conveyor 112 or 113.
- Handles lead and zinc concentrates
- Existing chute had issues with dust generation



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Project Background

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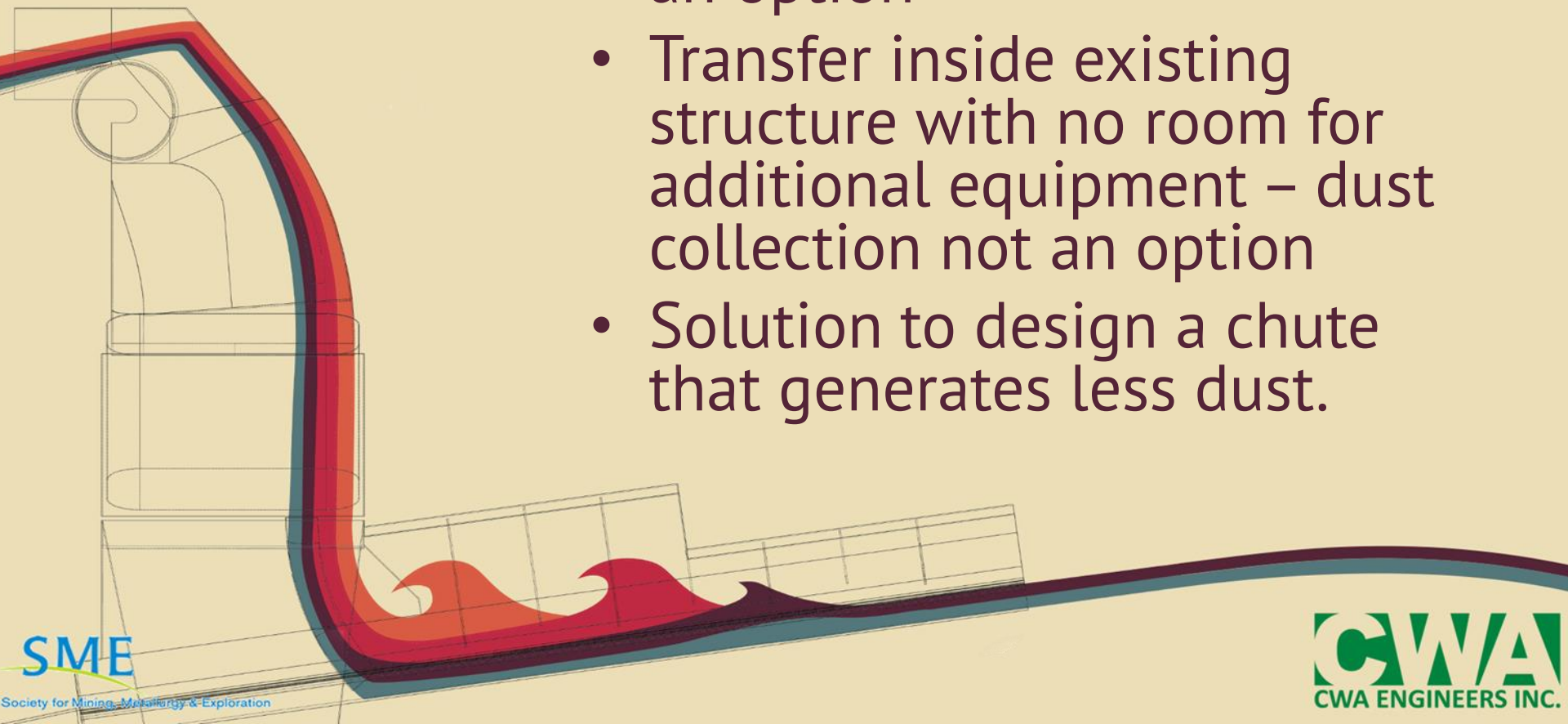
Project Background

- Product very sensitive to moisture – fog or water not an option
- Transfer inside existing structure with no room for additional equipment – dust collection not an option
- Solution to design a chute that generates less dust.



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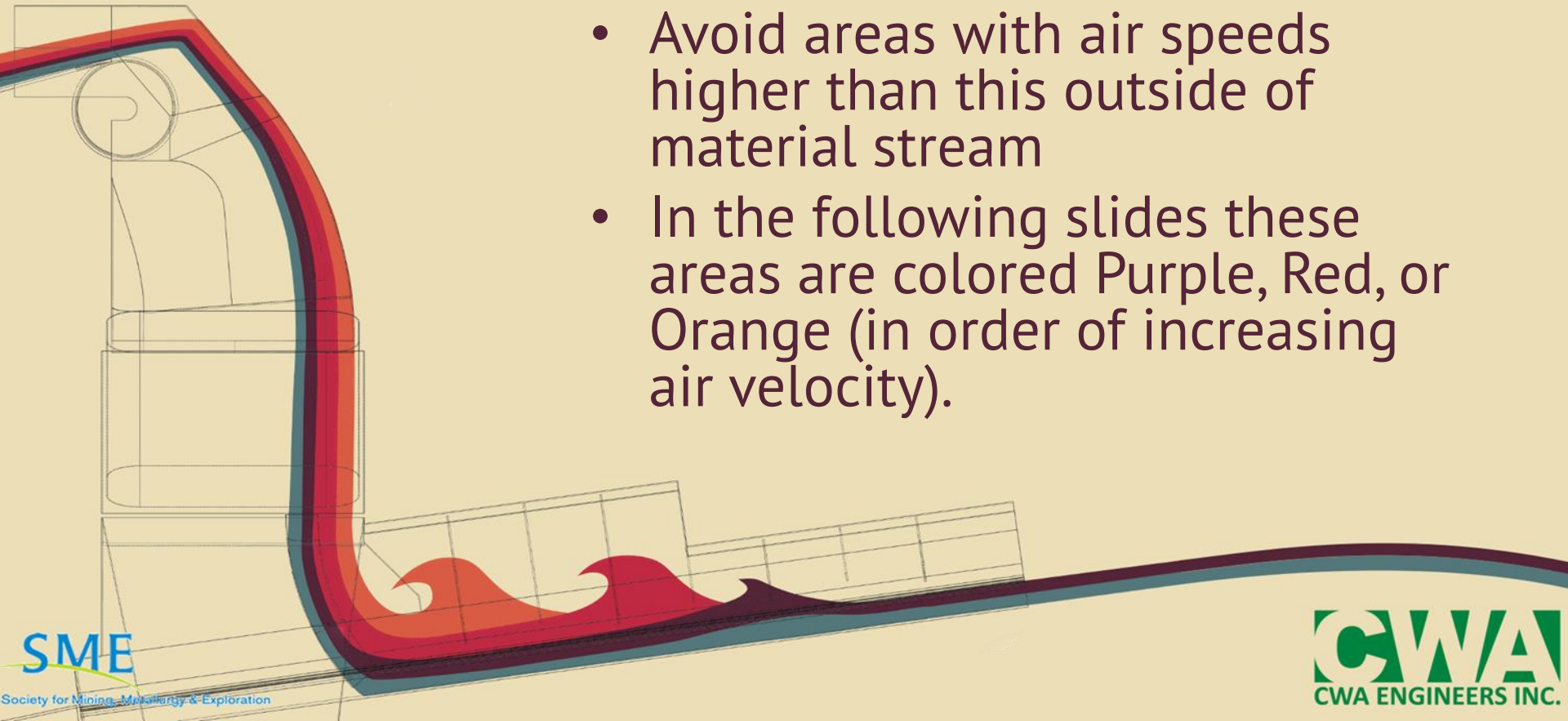
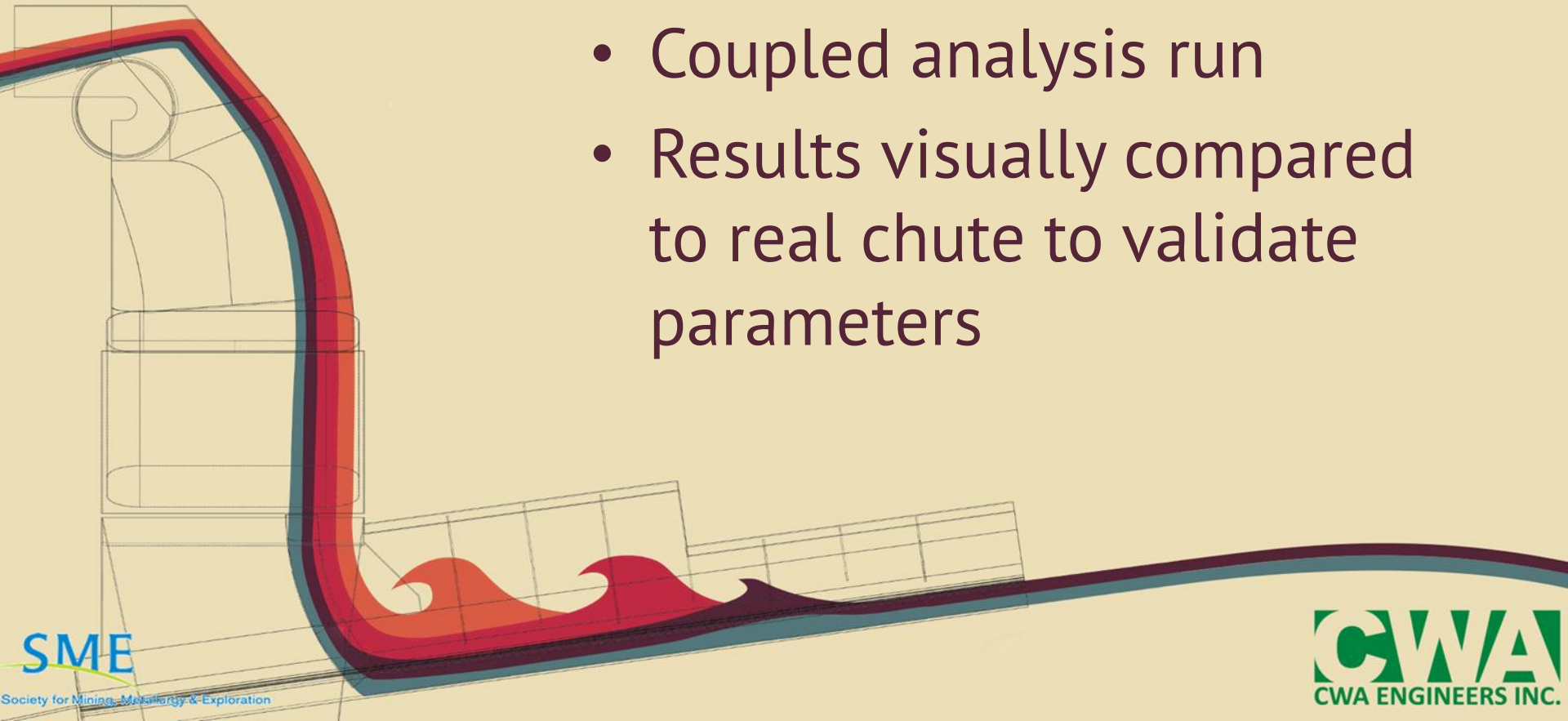
Criteria for Design

- Dust is picked up out of the material stream at air speeds of 1.0 to 1.25 m/s
- Avoid areas with air speeds higher than this outside of material stream
- In the following slides these areas are colored Purple, Red, or Orange (in order of increasing air velocity).



Application

- Original chute geometry modeled with SolidWorks.
- Coupled analysis run
- Results visually compared to real chute to validate parameters



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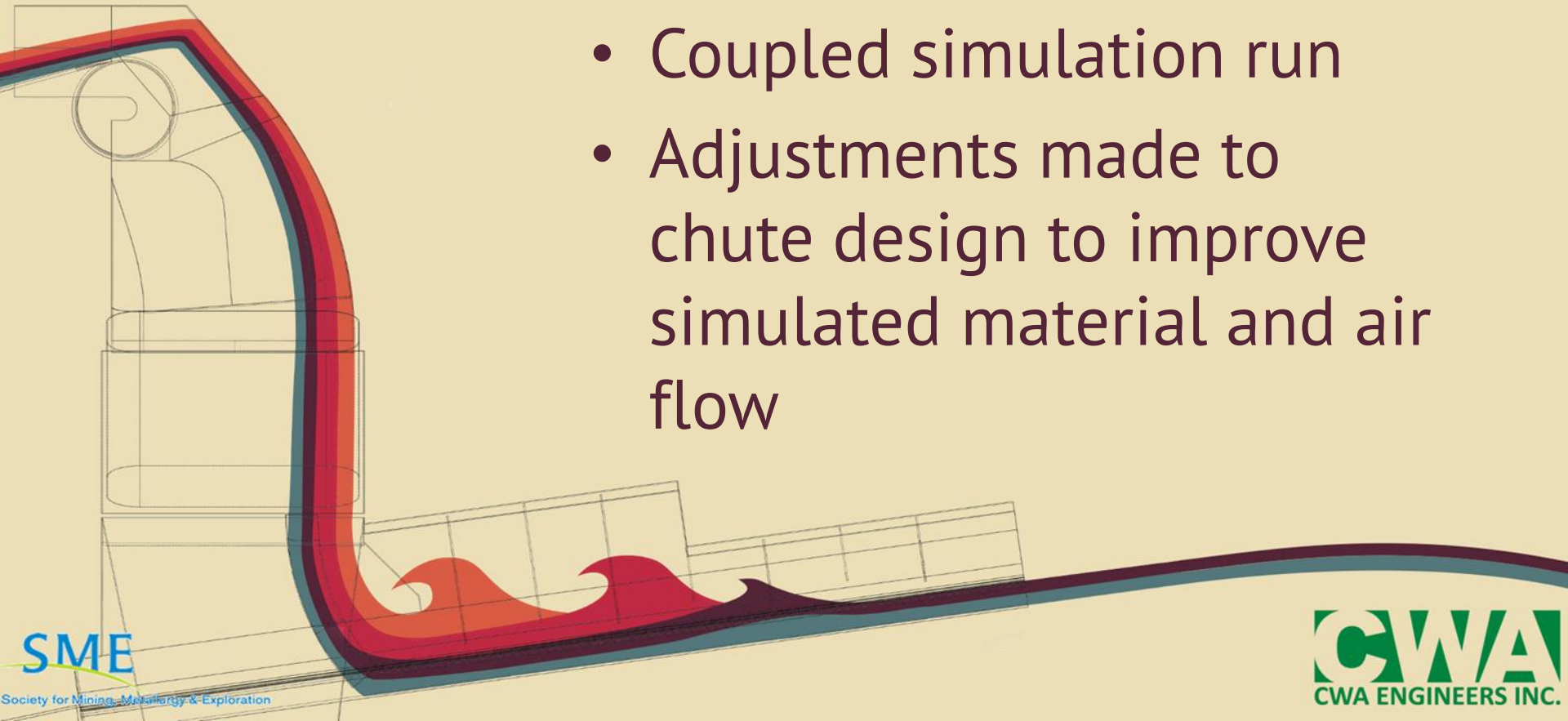
Application

- New chute geometry modeled with SolidWorks.
- Coupled simulation run
- Adjustments made to chute design to improve simulated material and air flow



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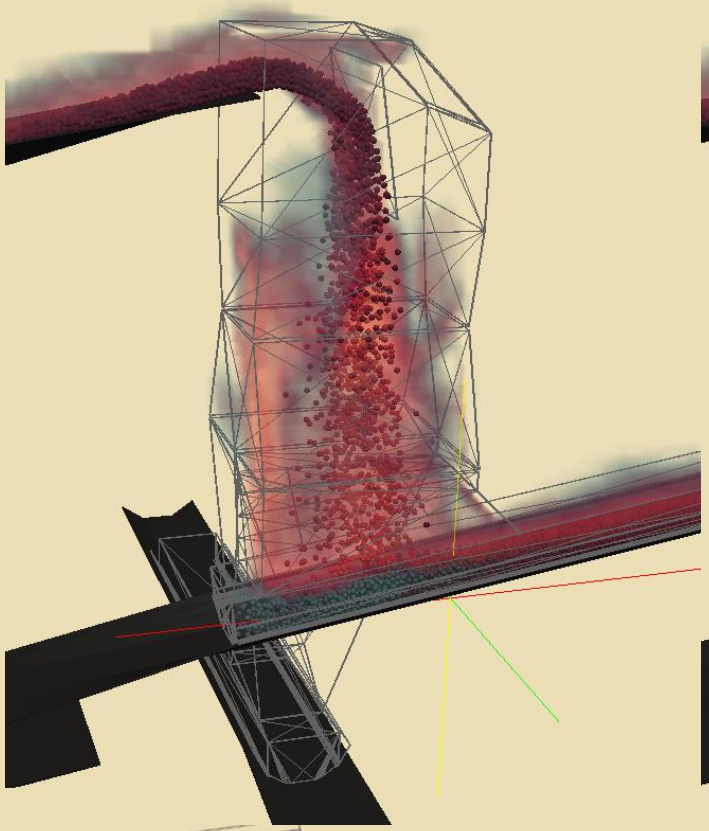
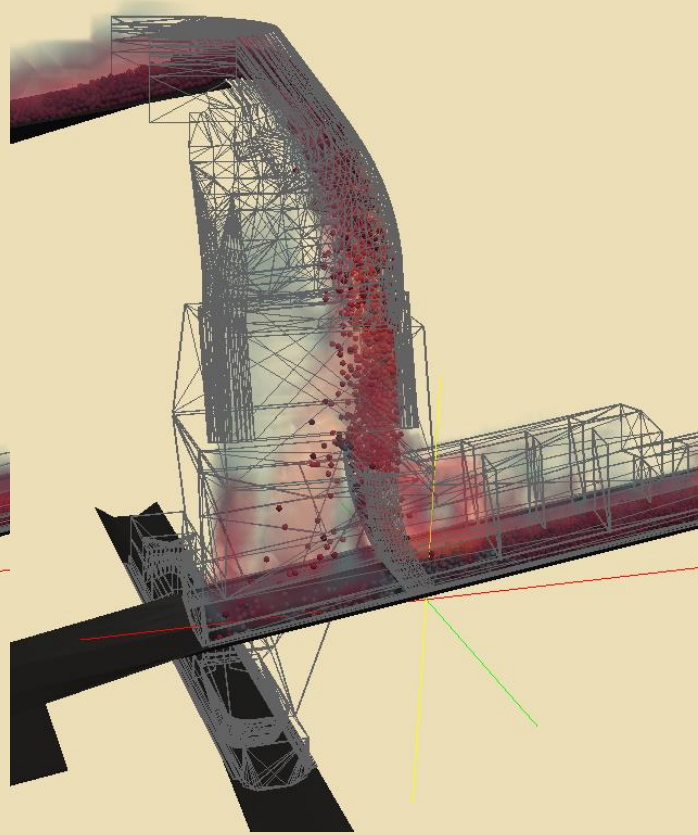
Original

New Geometry





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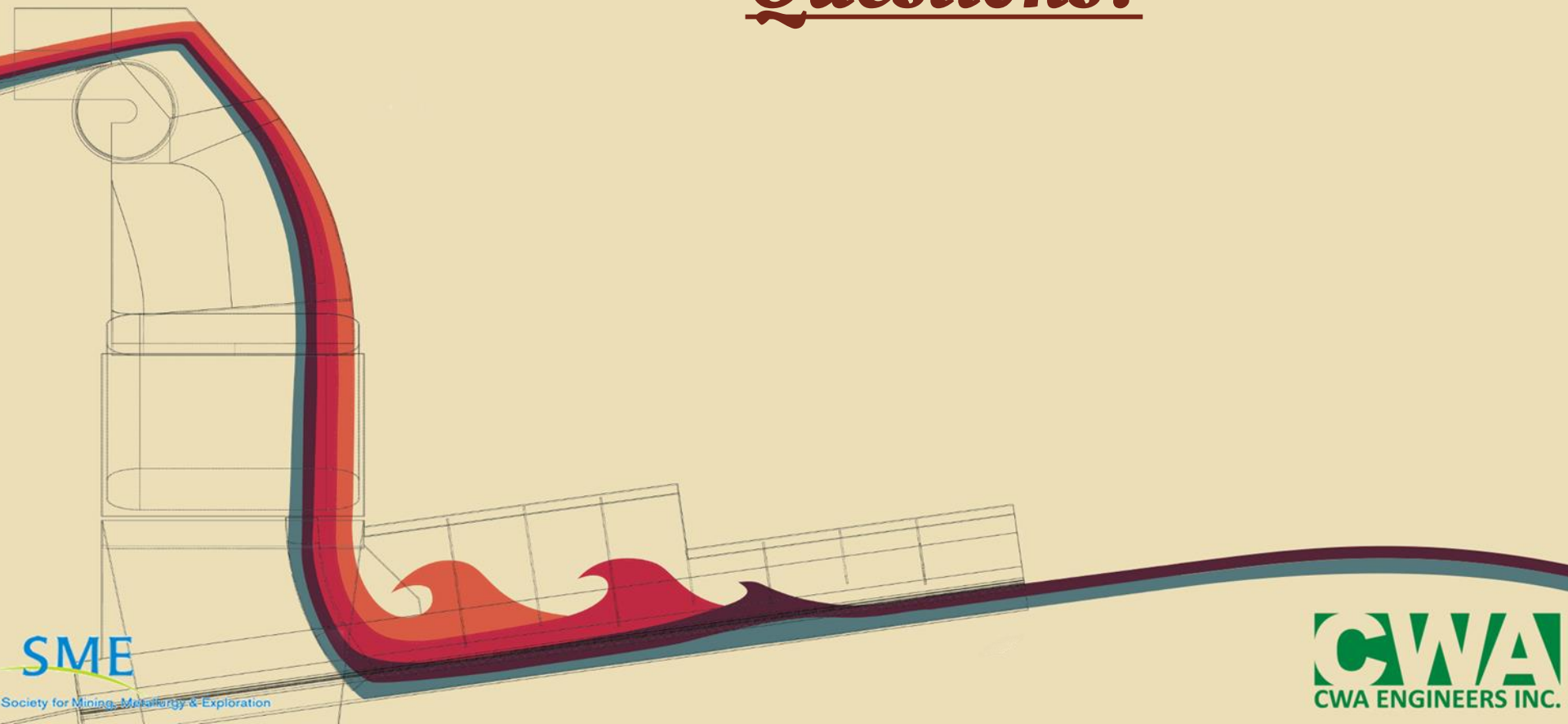
Questions?



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