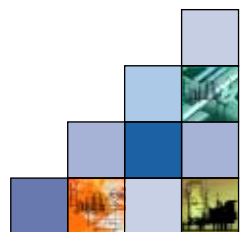


A 3D virtual world where you can visualize, plan, explore and analyze multiple sets of digital terrain data and 3D objects

Digital Terrain Modelling • Multiple DTM Layers • Design and Plan the Entire Survey Project with 3D Models • Design- and Visualize As-Built Seabed Interventions and Mitigations • Volume Calculations • Sedimentation • Port Design & Planning

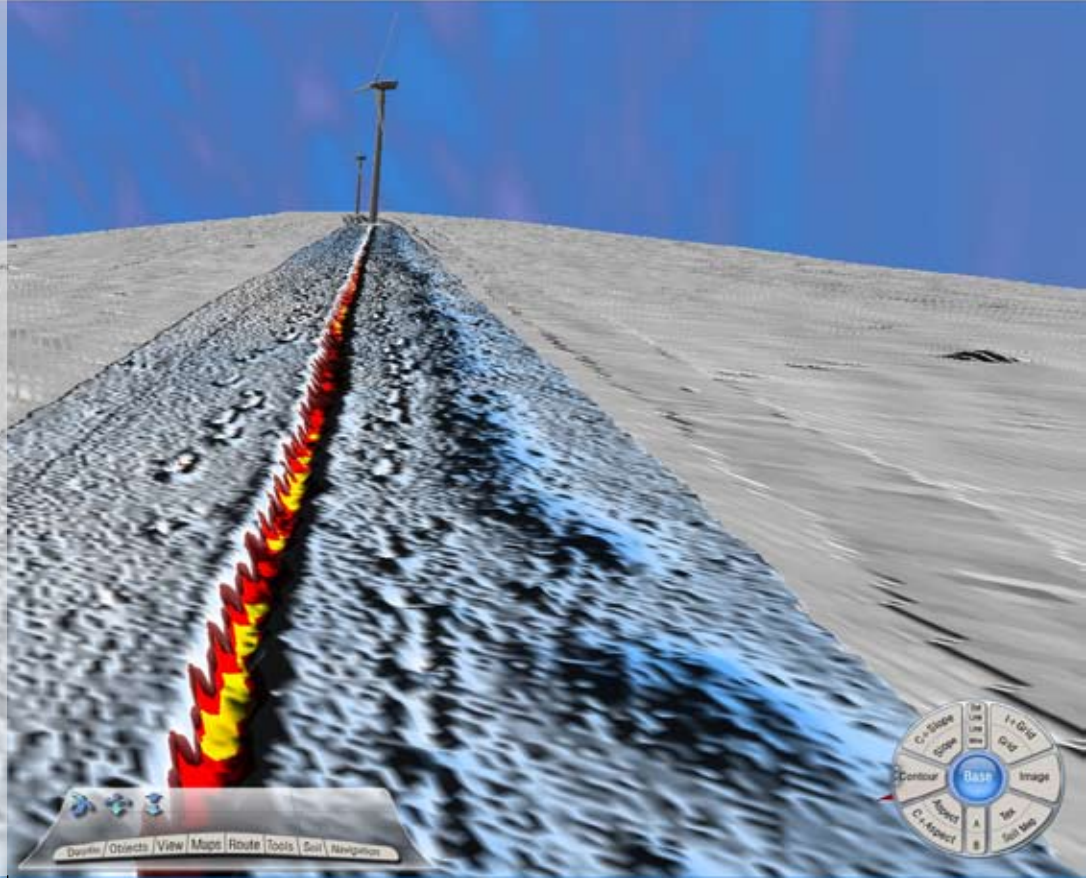


GeoLine3D

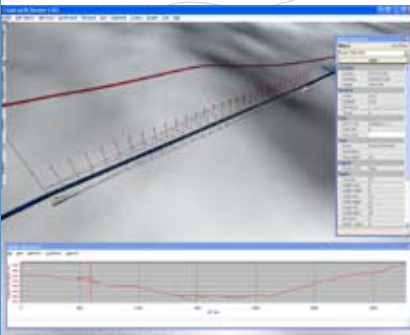
A 3D virtual subsea world, where you can visualize, plan, explore and analyze multiple digital terrain models with 3D objects.

Features:

- Import large and multiple terrain models
- Drape multiple images on the DTM (i.e. sidescan data)
- Visualize and plan the entire survey project with multiple 3D objects (i.e. structures and routes)



Contour map of terrain difference. Trench data is imported as secondary DTM layer using the user-friendly DTM Importer



Design trench rectification object, profile view and object inspector



High resolution texture map draped on a DTM with 3D solid objects

GeoLine3D (G3D) is a unique and powerful real-time dynamic visualization software for planning, exploring and analysis of any survey-, dredging-, rock dumping- and field development projects (terrain data and objects) within a realistic 3D environment (Digital Terrain Model, DTM).

G3D features real time interactive 3D visualization of small and large populated terrains with creation/import of multiple animated objects (i.e. wind turbines) and static objects (e.g. pipeline, cables, platforms, structures, harbour walls, vessels etc.).

Terrain and objects may be manipulated in real time while immersed in the 3D Virtual Subsea World using menus, floating toolbars, project manager and object/property inspector.

Terrain models may either be imported as ASCII XYZ, Surfer ASCII grid or ESRI ASCII grid file format, created from simple 2D profiles or created by using the unique contour scan to DTM feature. Other formats are implemented free of charge.

G3D supports direct loading of 3DS and DXF 3D solid object models on-the-fly. Object position and properties may be altered in real-time.

Multiple high resolution images (e.g. mosaic, seabed features, field layout, route plans), contour, slope, aspect, soil and texture maps may be draped on the DTM.

G3D can be used during the various project life cycle stages, from the initial feasibility study through detailed design, optimization and analysis to the in-service stage.

G3D can be utilised in connection with dredging works design and as-built quality control for shipping channels, ports and harbours, cable- and pipeline trenches.

GeoLine3D Technology

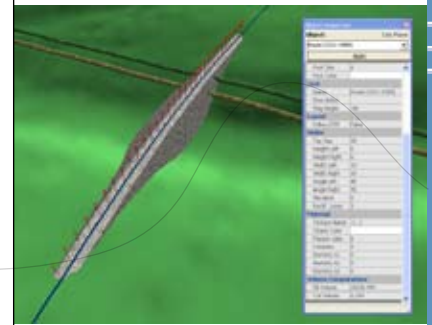
GeoLine3D graphical 3D engine is built on DirectX architecture with cutting edge-technology from the software gaming industry. To ensure a high and smooth performance when navigating around on the DTM an advanced dynamic Level of Detail (LOD) algorithm has been developed for terrain data and objects.

G3D Graphical User Interface (GUI) is a unique and powerful tool for visualizing, handling and combining DTM data with multiple objects (e.g. wind turbines, pipelines/cables, platforms and other structures) in a 3D virtual subsea world with a visual look that looks like reality and is easy to work with for the engineer and surveyor.

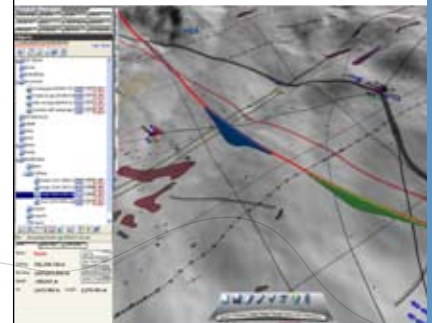
GeoLine3D GUI features include:

- User-friendly DTM Importer for import of either regular gridded terrain data or irregular terrain data. Unlimited data file size
- Regular grids may be imported directly whereas irregular terrain data (i.e. raw data) is imported using the Triangulation with Linear Interpolation gridding method. Both methods allows for data reduction. Min. grid is 0.1m
- Terrain models may be imported as ASCII XYZ, Surfer ASCII grid, and ESRI ASCII grid. DTMs may also be created from contour plots or using a simple 2D profile (KP vs Elevation). Other formats are implemented free of charge
- Multiple routes may be imported using the Import Route Wizard, ESRI shapefile and design route file or created in real-time on the DTM using the Route Designer. All routes are rendered as realistic 3D objects with properties; size, texture, color, title, logo etc.

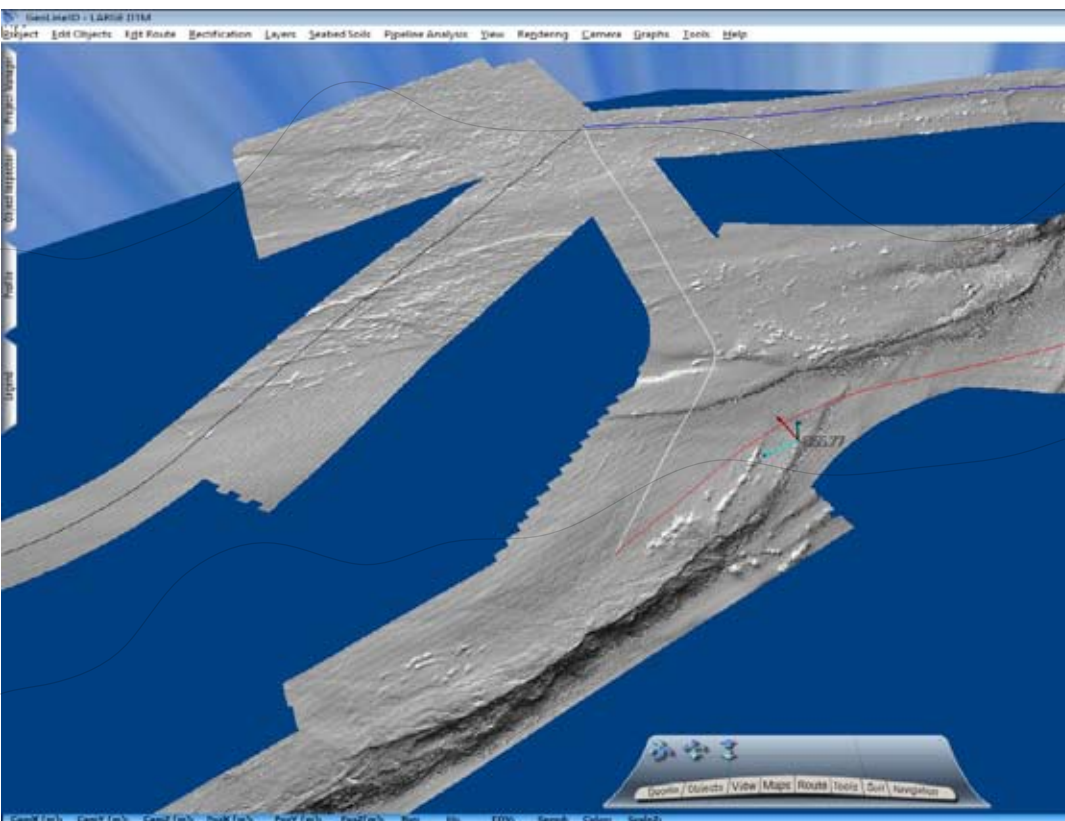
Import of digital terrain data for a large offshore field development with multiple design pipeline routes, structures and platforms (94 million points)



Rock berm design object along a route and object inspector



All data, objects and map templates are accessed and organized in the Project Manager (PM)



Large DTMs

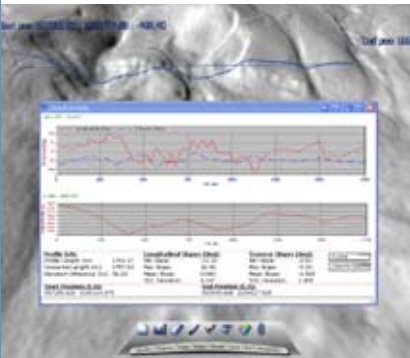
Using an adaptive Level Of Detail (LOD) algorithm large terrain data may be imported and visualized in realtime.

Multiple Routes

Multiple routes may be imported using the Import Route Wizard or created in real-time on the DTM using the Route Designer. All routes are rendered as realistic 3D objects.



Refinery 3D solid object imported into G3D



Profile view with seabed slope graph

- Routes may be copied, extended or moved to new locations on the DTM in real-time. The KP order may also be reversed
- Route objects support import of multiple profiles per object i.e. design-, as-laid-, as-trenched and in-service profile
- Easy navigation between the imported route profiles and activate the profile to be displayed on the DTM
- Display the route profile view including the rectified seabed profile. Secondary DTM layers and objects with the support property switched on are displayed on the graph as well. Display the route plan view and slope graph or compare multiple route profiles. Bring up the cross section profile dialog at any selected KP point. The user may point-and-click on the profile graph and the camera view is moved to this location
- Intuitive point-and-click on the terrain or route profile view for seabed intervention (rectification) and design mitigation before or after the route has been created
- Seabed interventions and design mitigations are visualized real-time on the DTM using realistic looking pre-defined 3D objects e.g. Cutplane, Rock Berm, Trench and Supports. Object properties may be altered in real time using the Object Inspector (OI). Cut and fill volumes are automatically calculated
- On-the-fly insertion of complex 3D solid objects (i.e. harbours, platforms, structures etc.) on the DTM using the 3D Solid Importer. 3D solid object formats are G3D, DXF, 3DS or Milkshape. Object position and properties may be altered in real-time using the OI
- Every object inserted on the DTM has a set of properties that are displayed in the OI. The OI allows the user to view and alter the properties in real-time

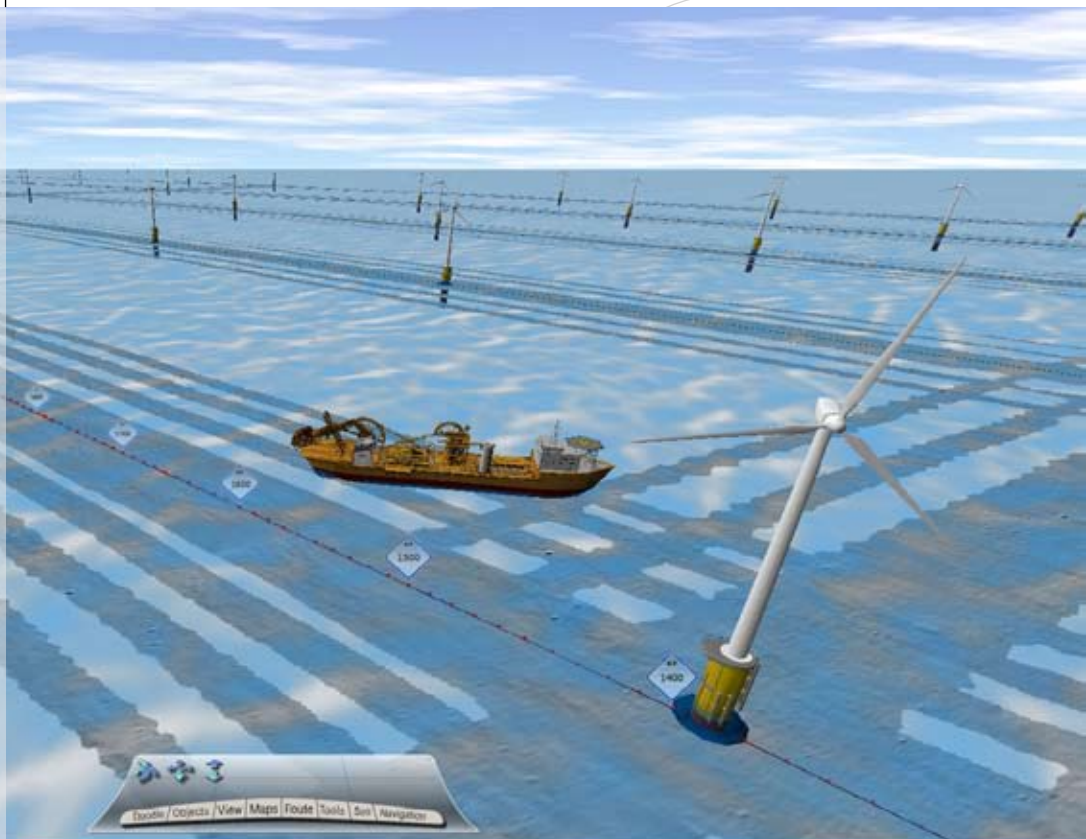
Visualize large offshore windfarm projects, multiple cables, trenches and animated wind turbine objects

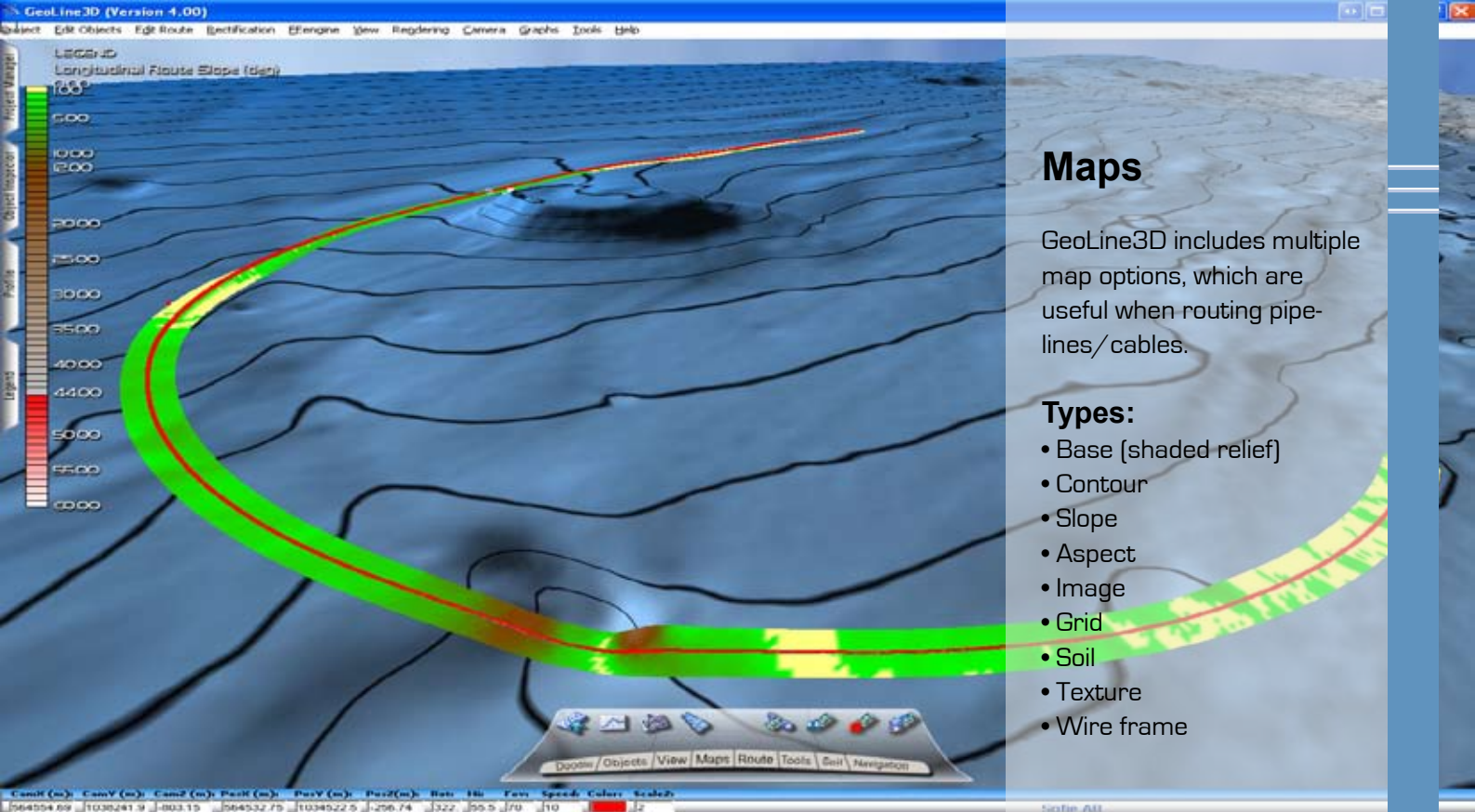
Field Developments

Create and visualize the entire field development by combining DTMs, objects and documents in one project.

Visual Look

Set the lighting source options, use the sea and fog options to render a visual look like it looks in reality.





Maps

GeoLine3D includes multiple map options, which are useful when routing pipe-lines/cables.

Types:

- Base (shaded relief)
- Contour
- Slope
- Aspect
- Image
- Grid
- Soil
- Texture
- Wire frame

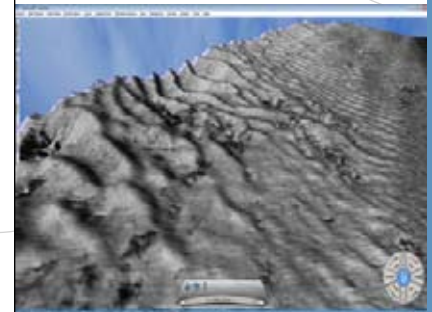
Contour map and traverse slope rendered on the DTM along a route

- Fast generation of contour, slope, aspect, grid, texture and soil maps. Combined maps may be draped on the DTM
- Fast generation of route mesh draped on the terrain along the selected pipeline route with option to render traverse and longitudinal terrain slopes on the selected map displayed
- Document objects (e.g. Word, Excel, PDF and Images) may be inserted at any location on the DTM or in space
- A novel 3D document holder displays the document thumbnail, which includes a doodle layer for simple drawings and notes. User may also attach a note object to object. Double click on the document to view the full document. The document thumbnail is updated in real-time.
- Create and import Point Object file, which allows the user to place multiple document objects along i.e. a route

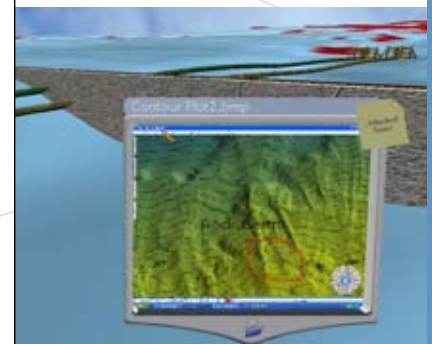
- Multiple label, line and note objects may be inserted on the DTM and edited using the OI
- Drape side scan mosaic and multiple high resolution maps (e.g. seabed feature, route plans) on the terrain using the Map Wizard. Formats include Geo-Tiff, BMP, JPG and TGA. TGA format includes alpha channel to create transparent image. All file formats may be imported with a world file of projection information (twf)

- Analyze the pipeline/cable seabed interaction behavior using the worlds most powerful Pipeline FE-Engine (finite element analysis module). Following laydown the user may run a series of full 3D analysis (e.g. on-bottom roughness analysis, lateral buckling analysis). All analyses are viewed graphical in real-time.

- In-service pipeline data module to import, store and display e.g. free spans, coating damage information



Side scan mosaic data draped on the DTM (Geo-Tiff)



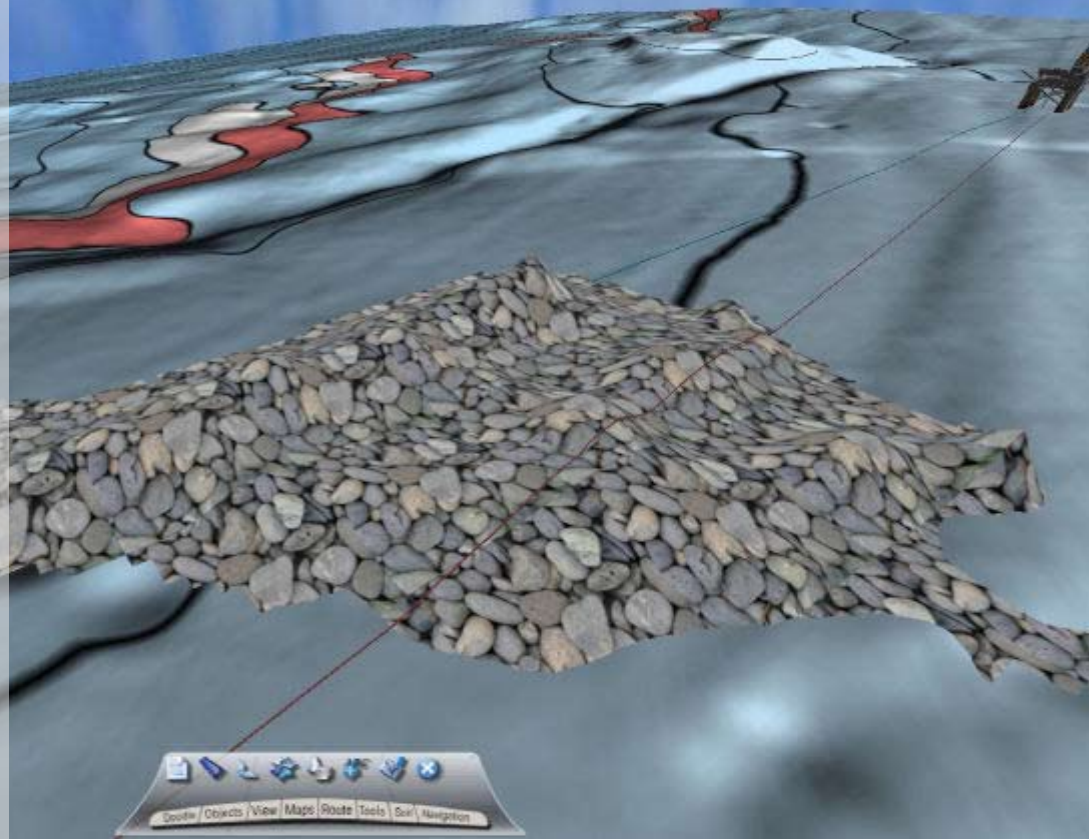
Document thumbnail (object) with doodle layer and notes (e.g. Word, Excel, PDF and Images)

Objects

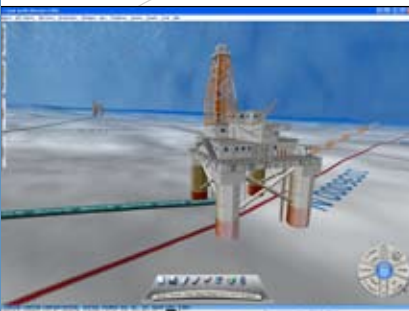
Multiple objects may be inserted on the DTM on-the-fly using intuitive point-and-click options.

Object Types:

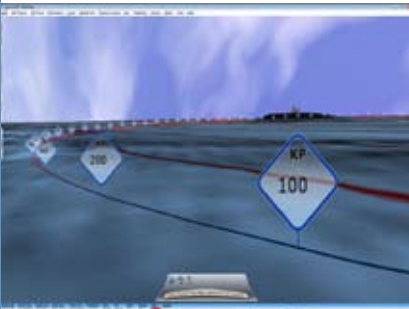
- Route (i.e pipeline/cable)
- Rock Berm
- Trench (open/close)
- Cutplane
- 3D Solid (DXF, 3DS)
- 3D Solid XYZ
- Document (i.e. word, PDF)
- Lines, Labels and Notes
- Support Objects
- Image Objects



3D solid XYZ object rendered with rock dump texture. The object includes support and z-layer behaviour thus interacting with routes



3D Solid Platform Object - G3D supports 3DS, DXF and Milkshape



KP sign posts are rendered along the selected route

- Import XYZ data as 3D solid XYZ object with individual texture options. Objects are triangulated. Object properties include texture, color, support, z-layer etc. When compared with the original DTM the object fill and cut volume may be calculated. Minimum cell precision is 0.1m. If required the object may be translated horizontally and vertically.

- Unique 3D solid object behaviour options include z-layer, support behaviour and material ID properties. These properties allow the objects to be rendered in the correct order and interact with route objects defined on the DTM

- Routes and objects may be highlighted for better overview. User may hide unwanted objects or fix objects to a specific position on the DTM

- Export DTM options allows the user to export the entire terrain model, part of the terrain (selected region) or terrain boundary along a selected route. Export formats are ASCII XYZ, Surfer ASCII grid and ESRI ASCII grid.

- Use the DTM Image Map Toolbar to export the entire terrain model or part of the terrain (dynamic selection tool) to an image. Image formats include Tiff, BMP, JPG, PNG, GIF and TGA with world file projection information. Set the pixel scale and number of tiles to export. Maximum resolution is 4096 x 4096

- Use the flexible and powerful alignment sheet generation to create alignment sheets/charts along a defined route on the DTM. Save and load template options with pre-defined templates. Print or export the alignment sheets to i.e. PDF-format

- Use the Soil Properties Editor to define soil types or select pre-defined soil types from the built-in soil database. The Soil Properties Editor includes soil properties, soil model, vertical soil model and pre-defined soil type options for use in the route analysis module

- Use the Soil Map Editor to intuitive point-and-paint pre-defined soil types directly on the terrain. Alternatively apply selected soil type to the whole terrain or apply it along a route from KP to KP.

- When inserting an object on the DTM the user is prompted for the object reference. This may be either a defined route on the DTM or as a global object

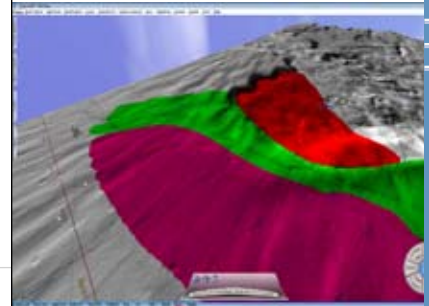
- Selection of a route on the DTM highlights the route and displays by default KP sign posts every 100m along the route. For better navigation the KP signs always rotate towards the user

- Summary of objects dialog with specific object type and route reference search options. Name, description, location, visibility and enabled options are displayed. Point-and-click on object in table translates camera view to object location and highlights object in the PM (if opened)

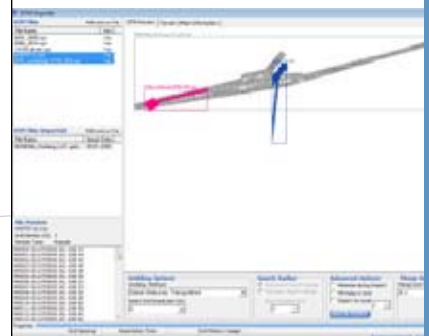
- Create amazing presentations along defined routes on the DTM or fly-through routes in space (save, load options) in high resolution

- Elevation editor allows the user to modify the DTM using different brush types e.g. Smooth brush is useful to fill small holes on the DTM after DTM importation

- DTM Data Quality tool allows the user to select any grid point on the DTM in wireframe view and show which original data points are used to determine the new grid point

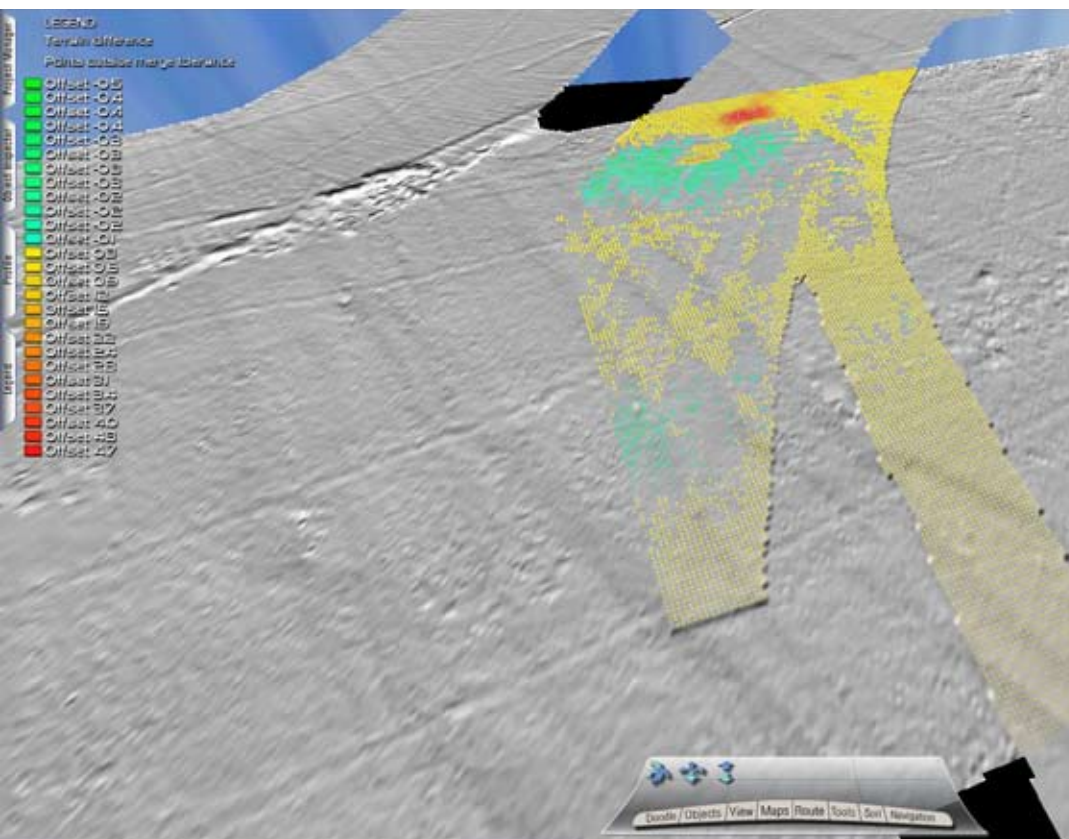


Soil map - user may interactively point-and-paint soil regions directly on the DTM



DTM Importer with file preview and DTM thumbnail pre-view etc.

Terrain difference rendered directly on the DTM using a color profile



DTM Importer

Use the user-friendly DTM importer to import terrain data to the main DTM layer or multiple DTM layers

DTM Info

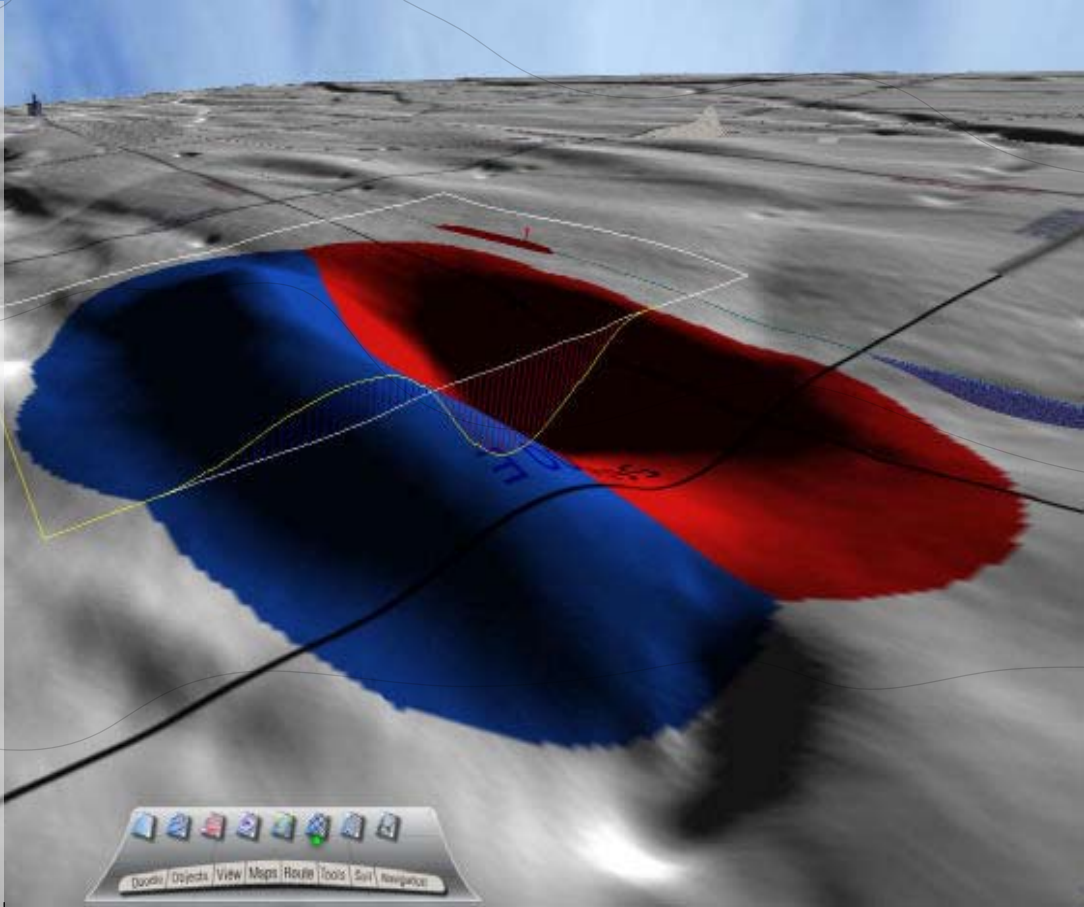
Terrain difference plots, boundary plots, highlight DTM plots and import reports are easily accessed through the Project Manager

Layers

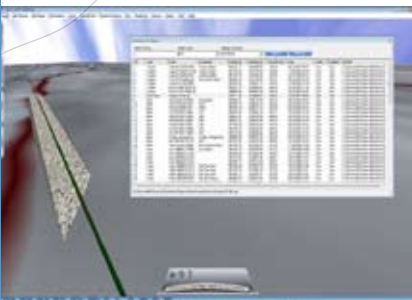
GeoLine3D supports multiple DTM data layers, which allows the user to easily and quickly compare DTMs and view cut (dredged) and fill areas.

Area & Volume

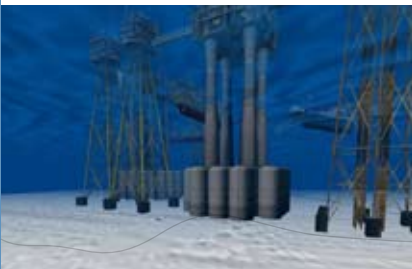
Intuitive point-and-click interface for selecting area on DTM and determine cut and fill areas.



Secondary DTM layer imported and highlighted. Color symbol: DTM rendered as red indicates cut area, blue indicates fill area



Summary of objects dialog, quick and easy search for any object type



Render sea and fog to create realistic visualization

- Import terrain data as a secondary DTM layer, which allows the user to compare DTMs and view cut (dredged areas) and fill areas
- Highlight cut and fill areas with a single point-and-click or contour the terrain difference using the contour template options
- Intuitive point-and-click interface for selecting area on DTM and determine cut and fill areas as well as cross section profile area between two layers. Minimum cell precision is 0.1m
- Secondary DTM layer options include save, load, merge and delete layers. The save and load option allows the user to import secondary DTMs. Furthermore the user may highlight the imported layer with original DTM rendered as wireframe
- All data, objects and map templates are accessed and organized in the user-friendly Project Manager
- The user may select/de-select multiple objects/nodes using the dynamic selection tool. The selection tool displays a green (or red) semi-transparent selection box on the DTM, which can be re-sized using the mouse
- Copy, clear and paste objects using the basket options which allows the user to easily and quickly copy objects to other locations on the DTM.
- Intuitive point-and-click interface for creation of viewpoints and flight-paths for animated fly-through, providing realistic impressions of walking or flying through the terrain or along a defined pipeline route

Why use GeoLine3D - Core Benefits

GeoLine3D is the ultimate 3D real-time visualization software with the world's most powerful purpose-built FE-Engine (finite element analysis module) for carrying out cable / pipeline analysis.

Save time and money:

- The start-up and running costs of GeoLine3D is low compared to other competing software packages i.e. it is a very affordable solution
- The GeoLine3D graphical user interface renders the COMPLETE survey project including multiple objects fast in real-time with smooth navigation using mouse. With the fast digital terrain model (DTM) and object importation routines the survey project can be visualized quickly and hereby provide the user with a TOTAL overview of the project for better design, planning and decision making hence save the costly project time.
- The GeoLine3D FE-Engine module is FAST and ROBUST and hereby saves the user costly time in analysis computation time. Furthermore the analyses results may be viewed graphical in real-time and hereby the user can stop the analysis running immediately – if the result is not as required. This will save the user time and frustration compared with post-processing the results after the analysis has been completed.

More accurate solution:

- The GeoLine3D graphical user interface is a powerful and indispensable tool because it renders the complete survey project like it looks in REALITY (DTM plus multiple routes and objects i.e. platforms, other structures) and hereby the user is at a better starting point for designing and planning the project i.e. routes and has better information for the key decision making.
- The GeoLine3D FE-Engine module includes a STATE-OF-THE-ART 3D ELASTIC-PLASTIC soil model for modeling the pipe-soil interaction. Thus the pipeline response is predicted more accurately and more realistic than any other software on the market and hereby provides the user with a better designed pipeline system and hence potential large cost savings. No other software program has a similar soil model

Maintenance and Technical Support:

- The GeoLine3D maintenance and support agreement includes prompt, courteous and knowledgeable technical support via telephone and email. Access to program updates, patches and new releases and notifications when new updates and released are available.
- Listen to our clients needs and suggestions how to improve G3D

About GeoLine

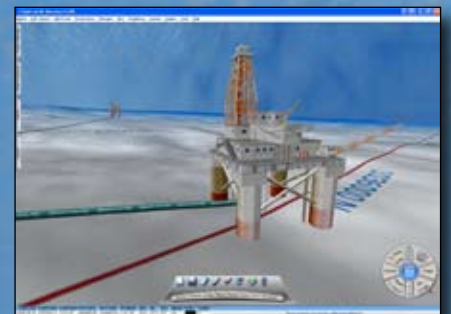
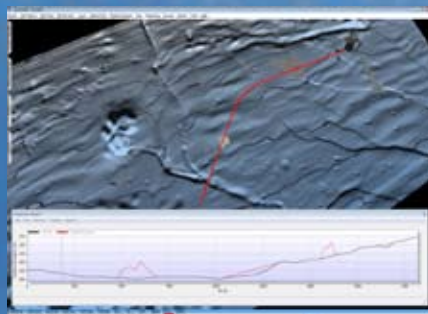
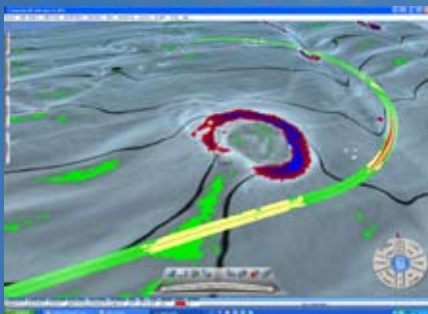
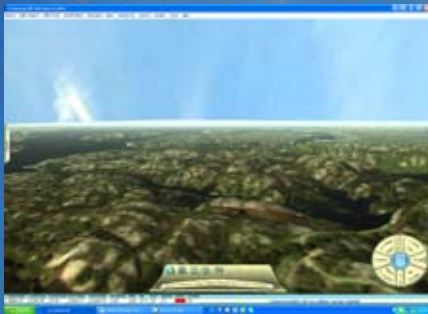
GeoLine is an independent engineering consultancy company located in Denmark. The company was founded in 2000 and provides professional consultancy advice for the planning, design and supervision of geotechnical and pipeline engineering projects as well as software development projects. We supply our services worldwide primary to the oil and gas industry.



360° planning and design



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