



DrillPlan

Coherent well construction planning solution
that maximizes the results from drilling teams
in a single, common system

DrillPlan Fundamentals

Training and Exercise Guide

Note: This guideline is updated on August 19th, 2020. Any further changes will not be up to date.

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Introduction – About this manual

DrillPlan in the DELFI Cognitive E&P environment forms part of a fully integrated well construction solution, which transforms the planning and execution performance, efficiency, and quality of every well drilled.

DrillPlan in the DELFI Environment, unites data, technology, science, and expertise from Schlumberger and the industry. The introduction of enhanced domain capabilities boosted by digital technologies and further integration with Microsoft Office 365 will lead to higher levels of collaboration and productivity among teams and stakeholders, across E&P disciplines.



The *DrillPlan Fundamentals* course is a Foundation level course and a requirement before taking any other **DrillPlan** training.

The course takes you from **DrillPlan** project setup to final reporting printout. Data import and workflows visualization also are presented. You learn how to create a well, define workflows, assign owners/reviewers/approvers as well as some engineering aspects. You also learn to visualize and quality check your data, for example, using the automatic engines traffic light process.

By attending this course, you gain a general overview of the basic functionality of **DrillPlan**. After completing the course, you will know enough about basic **DrillPlan** operations to build a simple well construction process.

Pre-requisites

To complete this training, you must have:

- English proficiency

- Basic Windows and practical computing skills
- Knowledge of drilling engineering domain fundamentals.

Learning objectives

After completing this course, you will be able to:

- Setup a **DrillPlan** project
- Navigate the **DrillPlan** user experience
- Import data
- Define tasks and custom tasks
- Set tasks owners/reviewers/approvers with deadlines for each
- Visualize the well data in the different engineering workflows
- Consume geomechanics microservices (optional – external)
- Define the report template.

What you need

In this course, you need the following hardware and software to perform the workflows:

Minimum recommended	
Operating System	Microsoft Windows 10 (or newer), or Apple MacOS X 10.8 (or newer) --- It works on handheld devices as well ⁽¹⁾ ---
Internet Browser	Google Chrome (preferred), New Edge from Microsoft, or Apple Safari 5 (or newer)
Internet Connection	Continuous connectivity with: <ul style="list-style-type: none"> • At least 10Mbps as download speed • <250ms of latency to the corresponding end-point (server) for best experience.
Test network	<ul style="list-style-type: none"> - http://clouddharmony.com/speedtest-for-all - http://www.azurespeed.com/

- A **DELF1** and **DrillPlan** subscription
- **Petrel** and **Techlog** licenses and license key (optional for specific workflows)
- Training datasets.

⁽¹⁾When using a handheld device, the user experience might be penalized as a result of the screen size.

1 Module 1 – Getting started

1.1 General Release Information

You will be able to find a general description of every workflow in the live release notes which are updated as part of the continuous delivery process. To access them, go to the URL below and browse the left side bar for the corresponding release date.

<http://releasenotes.drillplan.slb.com>

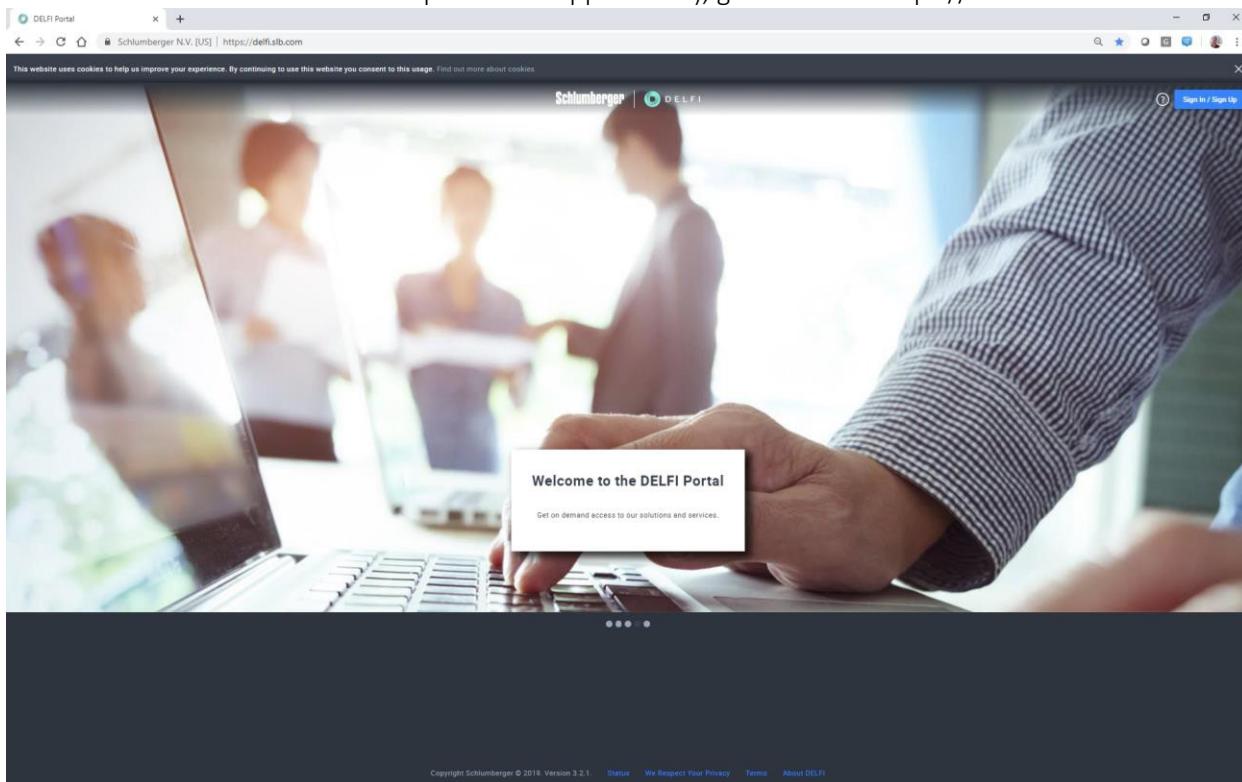
1.1 User Profiling

Every user needs to start by creating their own profile. This is done at two different levels:

1. DELFI Environment
2. DrillPlan Experience

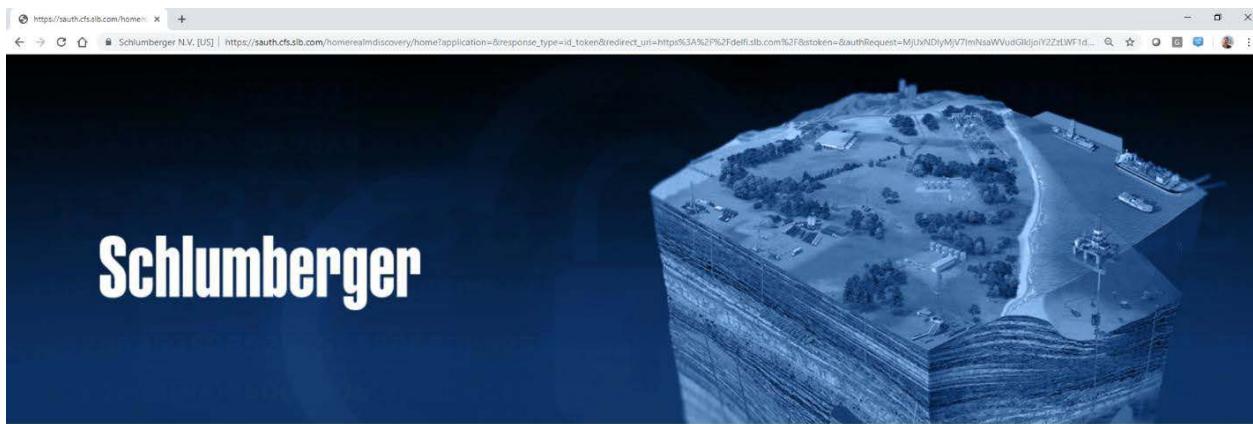
Let's start with the DELFI Environment.

Using your internet browser (Google Chrome is the recommended browser for better user experience, but it also works on Microsoft Internet Explorer and Apple Safari), go to this url: <https://delfi.slb.com>.



In there, select Sign In / Sign Up which will take you to the authentication page.

In this page, you will need to enter your email address to confirm your digital identity.



If you are already a registered user, you will be granted access to the DELFI Portal. Otherwise, select Register Now.

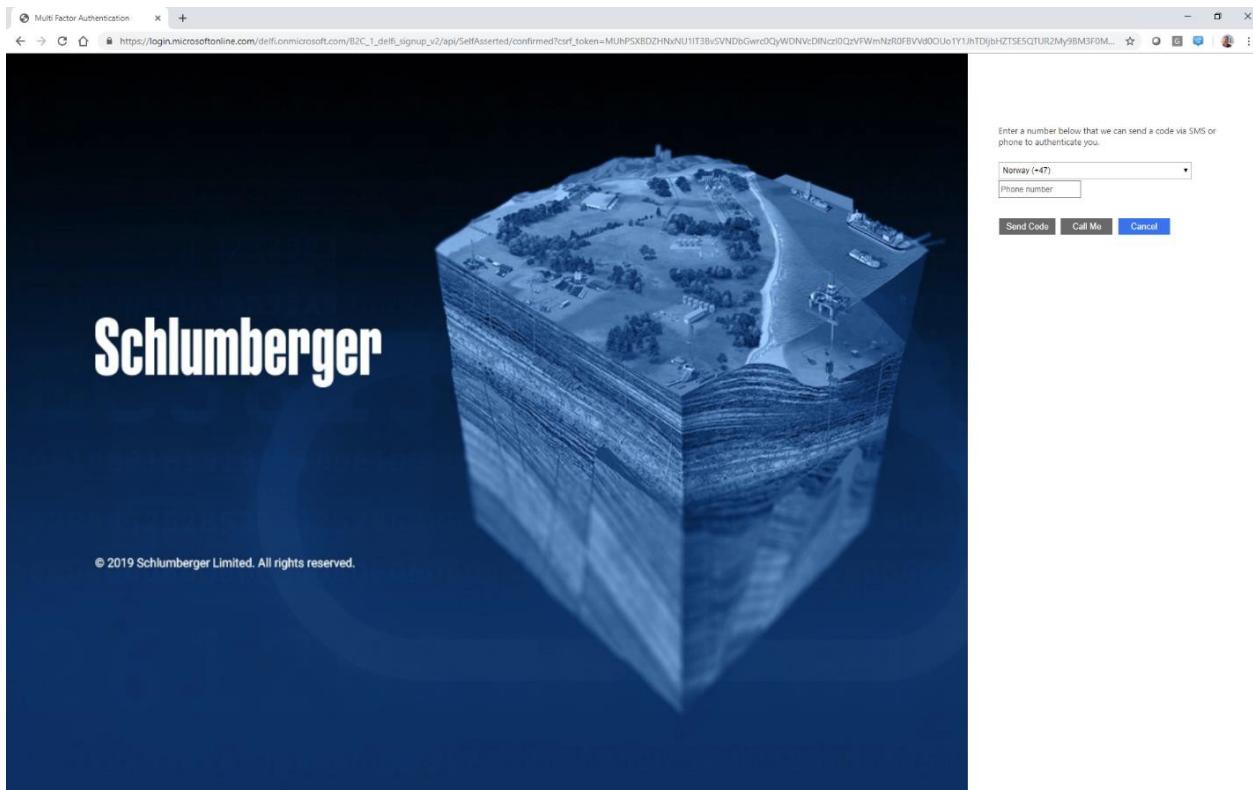


In this section, fill-in all the required data on the right-hand side. Start with your email and Send verification code. You will see a new line called Verification code to appear. Check your email inbox, type the verification code you just received and then select Verify code.

Make sure you have access to the email address you are using for the registration and if you do not get it in your inbox in the following couple of minutes, please check your junk/spam folder.

By doing this, you're confirming your email and allowing the system to proceed with your registration. Once done, select Create.

DELFI authentication process is federated with Microsoft Azure.

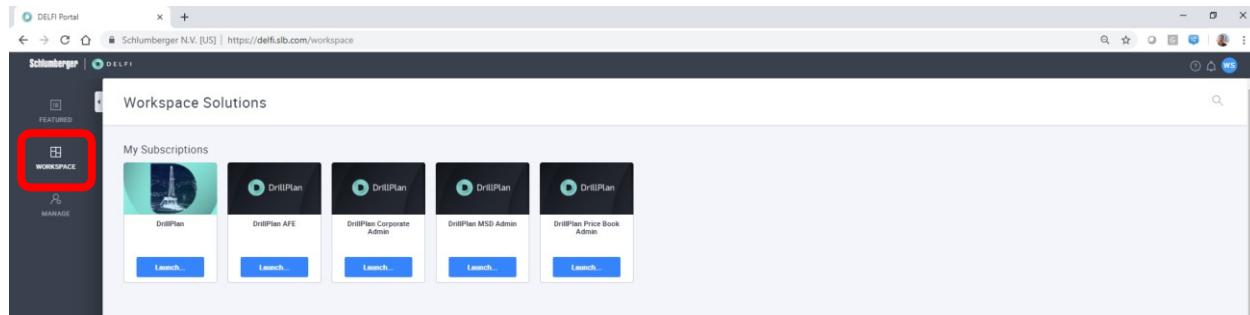


Afterwards, you will be requested for a mobile number to enable a 2-way authentication process. Adjust the area to your country and set your number prior selecting Send Code. If you are unable to receive a SMS or if you do not have access to your mobile, you can set a land line to receive a call with the code. In either case, write down the code and select Verify Code.

Once you have followed this process, you will be directed to the Featured Solutions in the DELFI Portal.

Once your user profile has been successfully setup in the system, you will be able to see all different Featured Solutions within the DELFI Environment. From here, you can Request the solutions that are relevant to your daily job.

As part of this training, you will already have access to DrillPlan (pre-setup process) which you will be able to see by selecting your Workspace on the left bar.



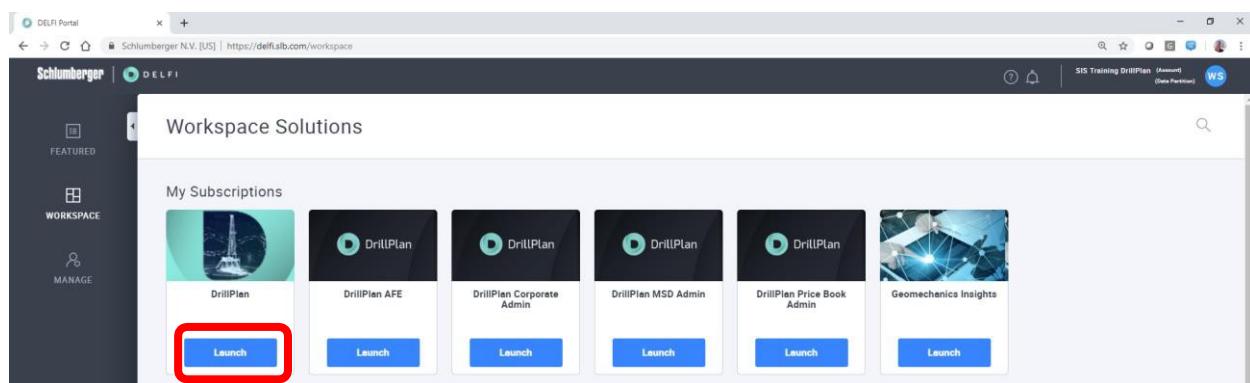
In DrillPlan, we have different access levels which restricts the access to specific workflows, like the price books or master survey database (MSD). As default for any user, the basic “DrillPlan” subscription is required to be able to launch the solution.

- DrillPlan  Minimum required
- DrillPlan AFE  For users who are intended to work with the AFE task
- DrillPlan Price Book Admin  For users who are intended to create and/or modify the price book templates in the system, in addition to the regular and restricted tasks
- DrillPlan Corporate Admin  For users who are intended to manage the corporate settings like safety factors and/or casing load definitions (as per company policy)
- DrillPlan MSD Admin  For users who are intended to manage the master survey database
- Geomechanics Insight For users who are intended to manage geomechanical models

The access restriction based on the user profiles is evolving as DrillPlan is being developed to ensure a more controlled team definition.

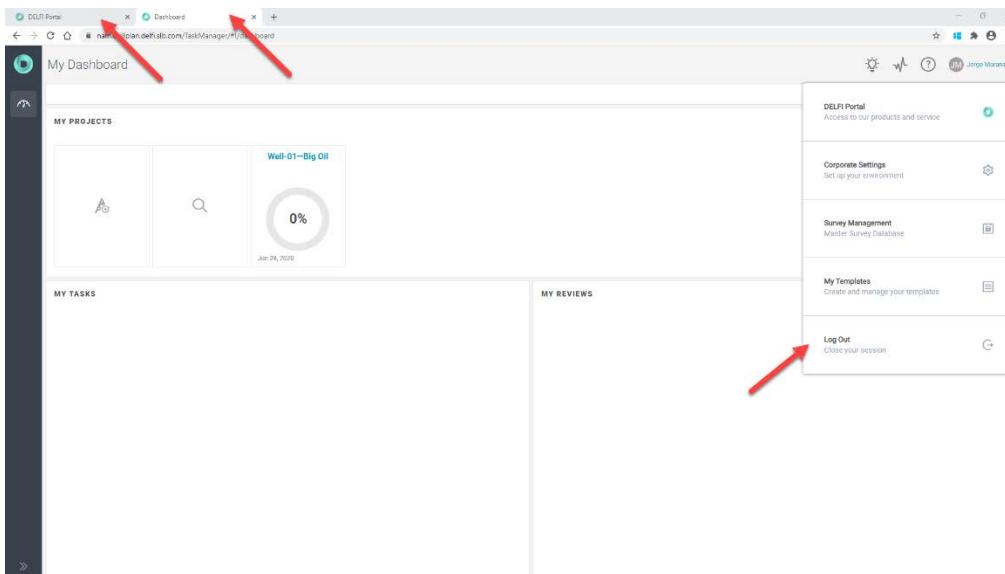
To launch DrillPlan, simply select Launch in any of the DrillPlan cards. Based on your subscription profile, the system will automatically select the appropriate end-point ⁽²⁾ to which you will run DrillPlan:

- NAM: <https://nam.drillplan.delfi.slb.com/>
- EUR: <https://eur.drillplan.delfi.slb.com/>



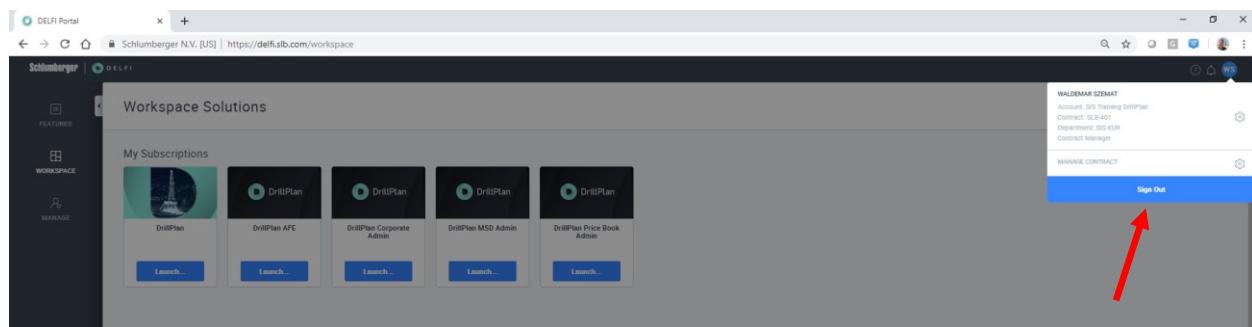
²These end-points are referred to the global cloud deployment as of July-2019.

When you launch DrillPlan, a new browser tab will be opened.



For the best DrillPlan experience and interoperability with the DELFI Environment, the following procedure must be adhered to:

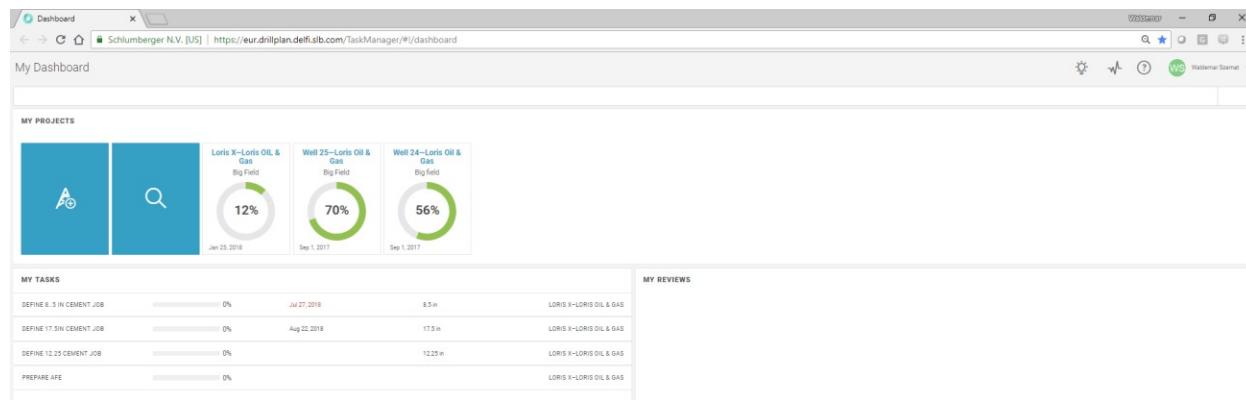
1. Once you launch DrillPlan and have the 2 tabs in your browser, close the DELFI Portal tab
2. If you need to change user access profile and/or DELFI contract, from the top right options, select your profile and then select DELFI Portal. This will automatically close the browser tab, sign-out your DrillPlan session and clear up your browser cookies
3. Back in the DELFI Portal, navigate as necessary. If you're intending to adjourn your day, it is always a good practice to Sign-Out your DELFI session



1.1 Initial DrillPlan Dashboard

The Dashboard is the DrillPlan landing page that users will see first when they login into the application. Through the Dashboard users can visualize My Tasks and My Reviews panes along with the ability to join or create a project.

A Project is the plan for a single well and all the activities and/or tasks that belong to this well.

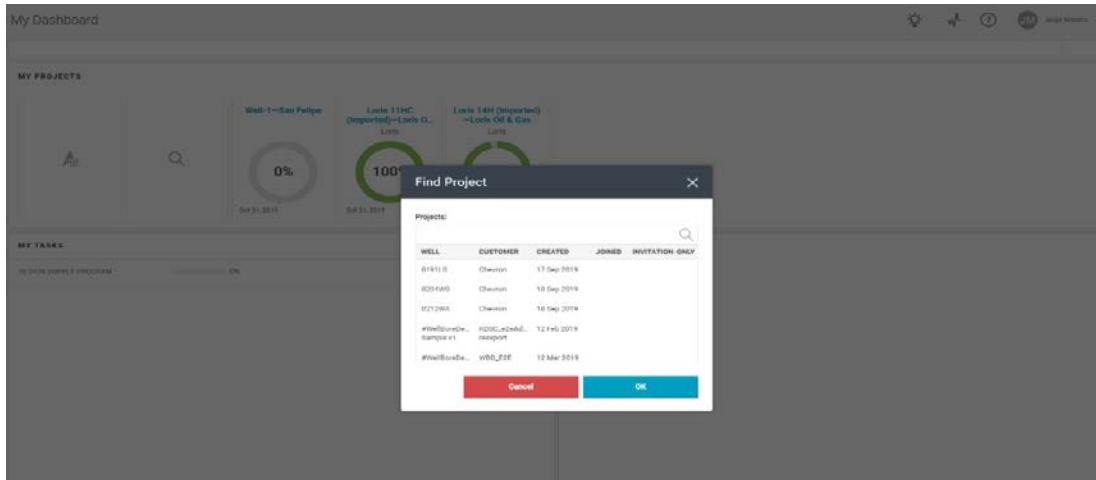


1.1. Join or create a project

In DrillPlan, users normally will Join an existing Project or create new ones. Please make sure that you have the required subscriptions roles assigned during this training. The following exercise will walk through this process.

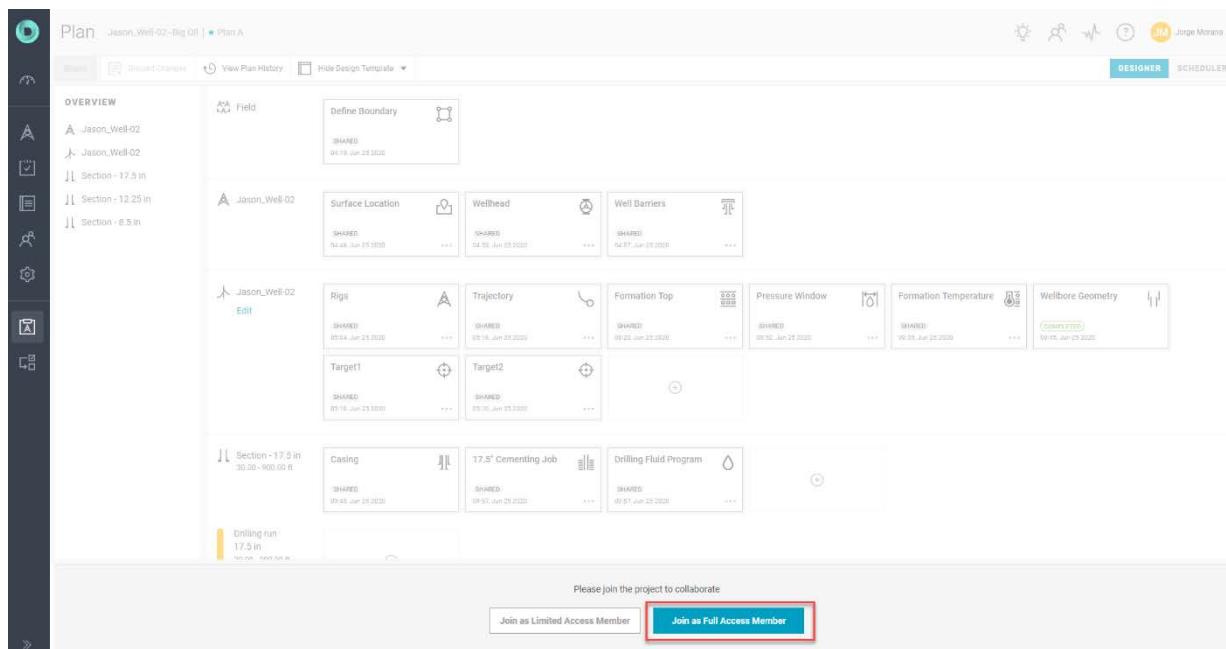
Before creating a new project, it is a good practice to search the existing projects. If the project already exists, users will have the ability to join the project, and, if the project does not exist, users can simply create a new project.

- On the Dashboard page, in the upper-left corner, click on  Find Project. The Find Project dialog box appears
- In the Find Project dialog box, type the well name you wish to search for. The existing projects or wells are filtered based on your input



- Select the well name you wish to join, and then click on the  button to have access

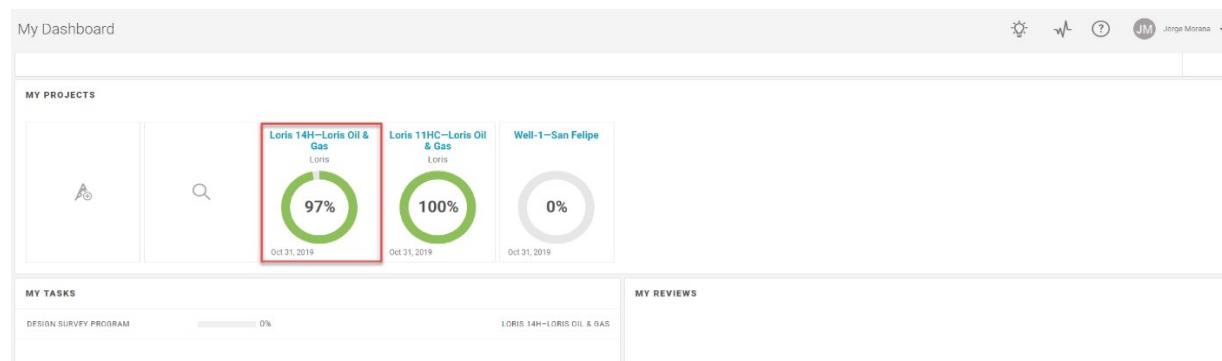
to the selected well



Please join the project to collaborate

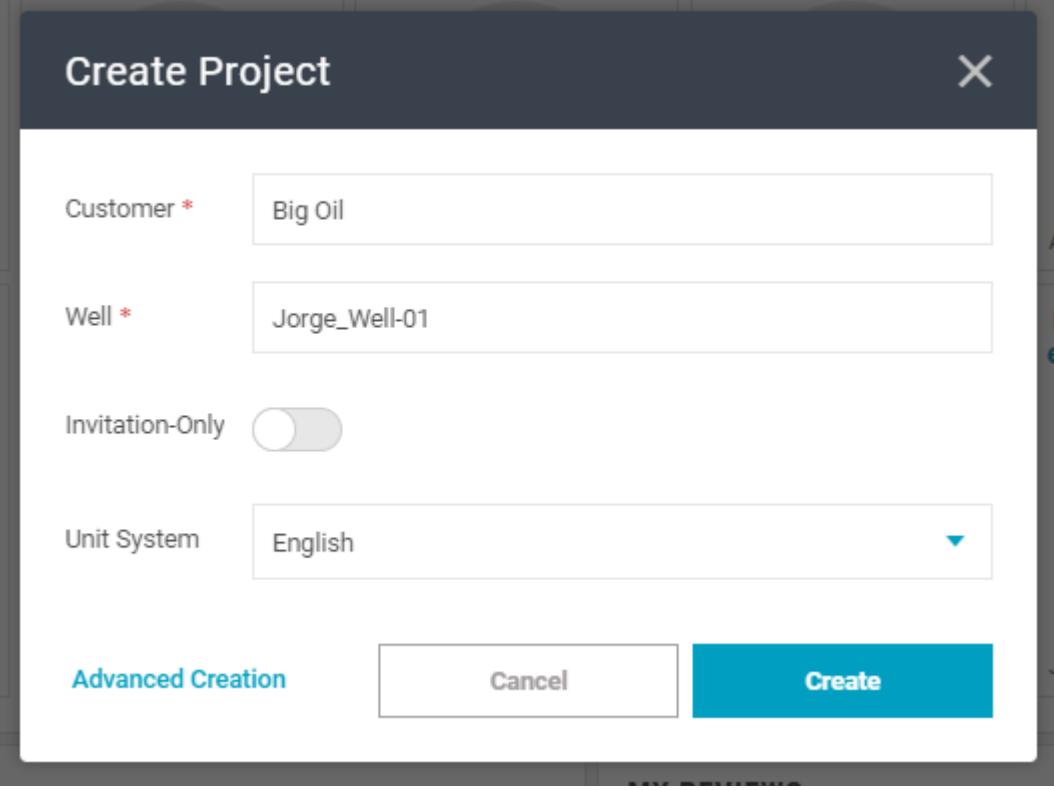
[Join as Limited Access Member](#) [Join as Full Access Member](#)

After you join the project, the project is added to your Dashboard page and then you can start to work on that project.



1.2. Create a project (Project Manager View)

1. On the Dashboard page, click on  New Project. The Create Project dialog box appears
2. Set Customer as: Big Oil, Well as: {your First Name} _Well-01



The screenshot shows the 'Create Project' dialog box. It has a dark header bar with the title 'Create Project' and a close button 'X'. Below the header are four input fields: 'Customer *' with 'Big Oil' entered, 'Well *' with 'Jorge_Well-01' entered, and 'Invitation-Only' with a toggle switch turned off. There is also a 'Unit System' dropdown set to 'English'. At the bottom left is a blue 'Advanced Creation' link. In the bottom right corner are two buttons: 'Cancel' in grey and 'Create' in a teal color.

3. For this exercise, keep invitation-Only toggled off and select English as unit system

Pay attention to the Invitation-Only option. This option restricts access to the project/well for other users to join and, when Invitation-Only is toggled on, it will only be possible to access when members are manually added by the well owner. We will explain this in more detail in Module 3.

Advanced Creation Project Options (General Information)

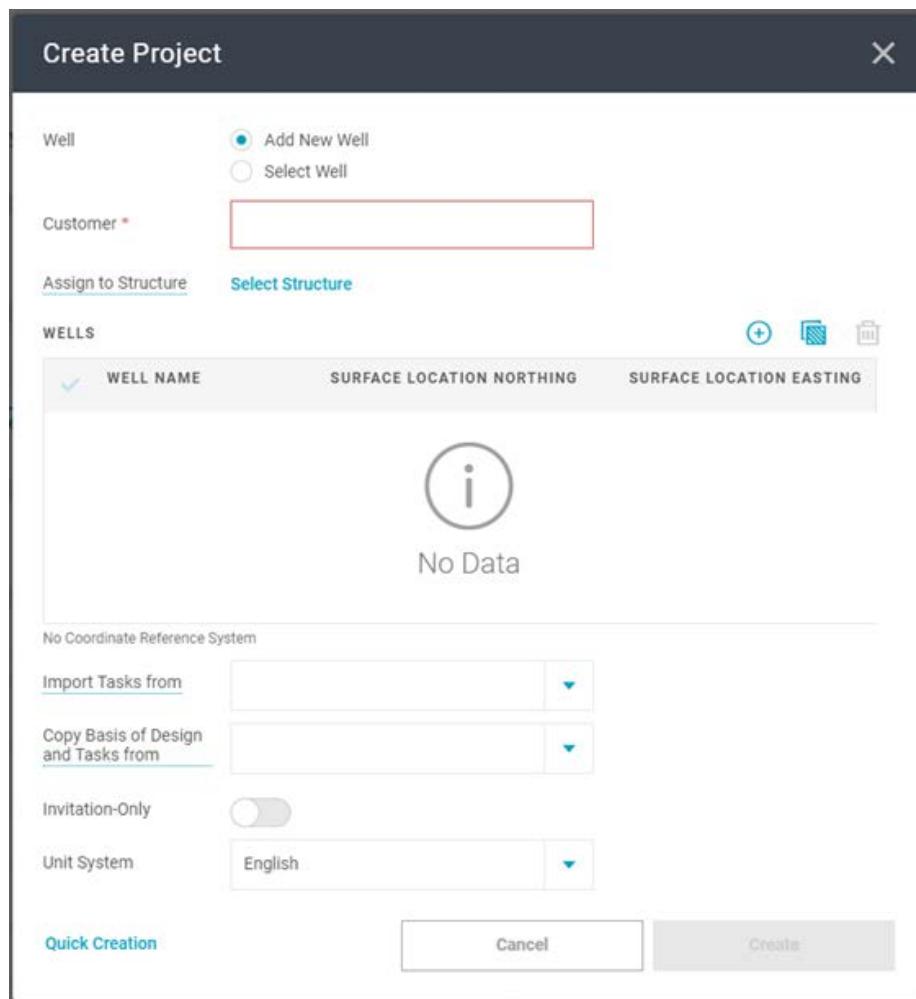
In Advanced Creation, you have two options:

Add New Well - Use this option if you want to create single or multiple projects, with the option to assign the well(s) to a structure.

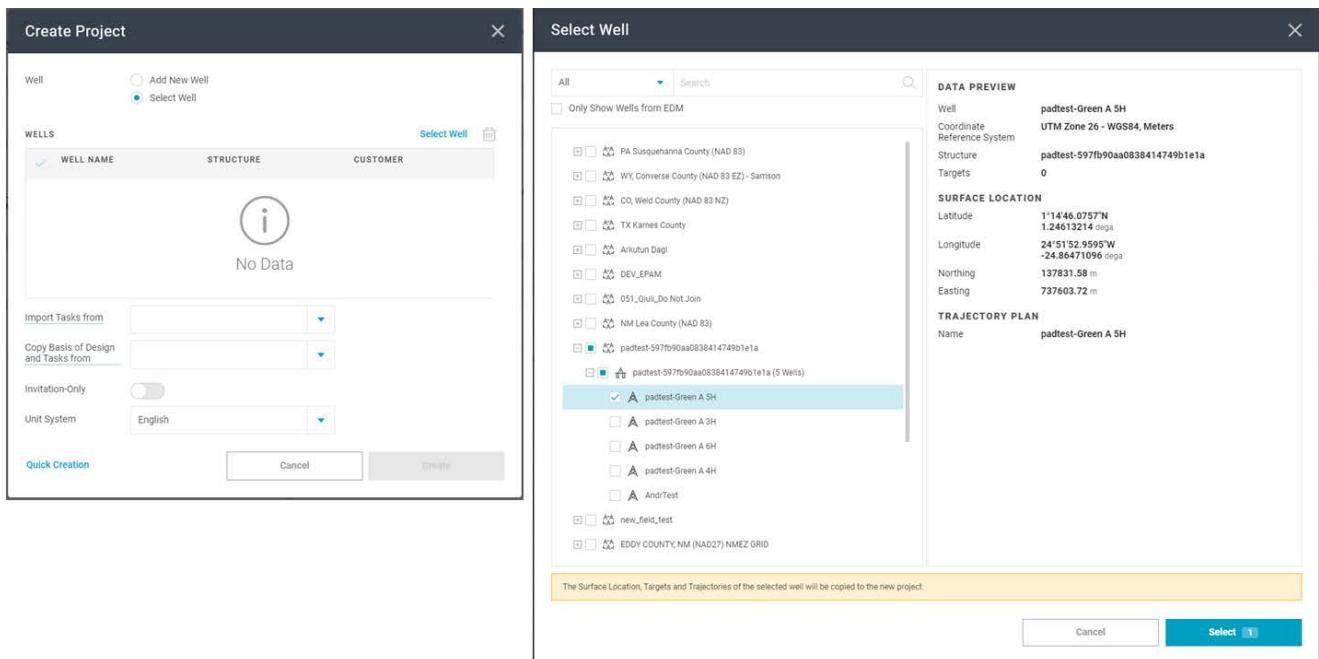
The new well(s) will then use CRS, field, structure type and north reference of that structure. New well slots will be created.

Optional: create project(s) from a task template or from an existing project (copy basis of design).

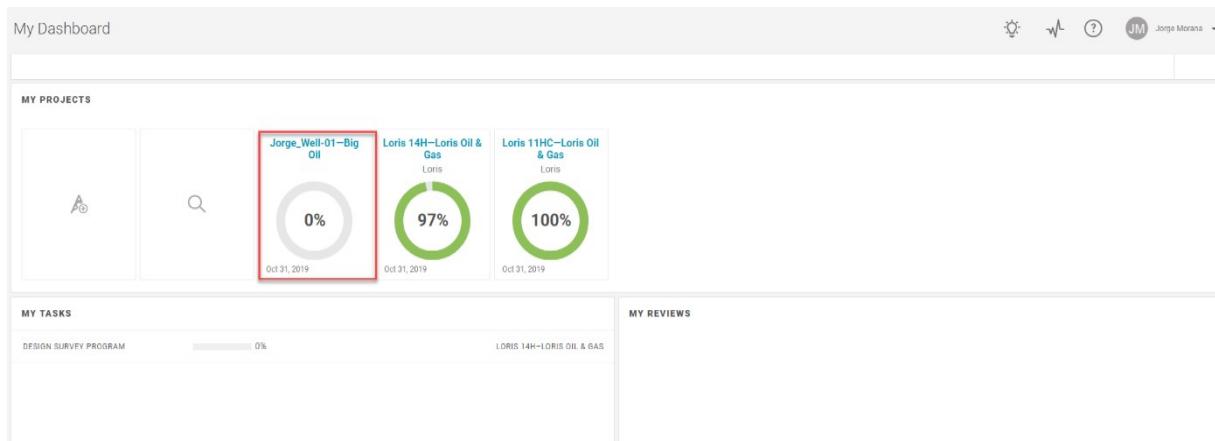
- Select Well - Use this option if you want to create project(s) from well(s) already existing in MSD (Master Survey Database). The surface location, targets and trajectory of the selected well(s) will be copied to the new project(s).
- Note: Only wells that are not already in DrillPlan will be listed.
- Optional: create project(s) from a task template or from an existing project (copy basis of design, but surface location, targets and trajectory data will still be copied from data in MSD rather than copying from the source project).



The screenshot shows the 'Create Project' dialog box. At the top, there are two radio button options: 'Add New Well' (selected) and 'Select Well'. Below this is a 'Customer *' field, which is currently empty and highlighted with a red border. Under 'Assign to Structure', there is a 'Select Structure' button. The 'WELLS' section contains a table with columns: WELL NAME, SURFACE LOCATION NORTHING, and SURFACE LOCATION EASTING. A large 'No Data' message with an information icon is centered in this section. Below the table, it says 'No Coordinate Reference System'. There are dropdown menus for 'Import Tasks from' and 'Copy Basis of Design and Tasks from'. A toggle switch is labeled 'Invitation-Only'. A dropdown menu for 'Unit System' is set to 'English'. At the bottom, there are 'Quick Creation', 'Cancel', and 'Create' buttons.



4. Back to our dashboard, the new project is now created on your Dashboard page



The screenshot shows the DrillPlan dashboard interface. At the top, there's a navigation bar with icons for search, help, and user profile (JM Jorge Moran). Below the header, the main area is divided into sections: 'MY PROJECTS', 'MY TASKS', and 'MY REVIEWS'. In the 'MY PROJECTS' section, three projects are listed with circular progress indicators:

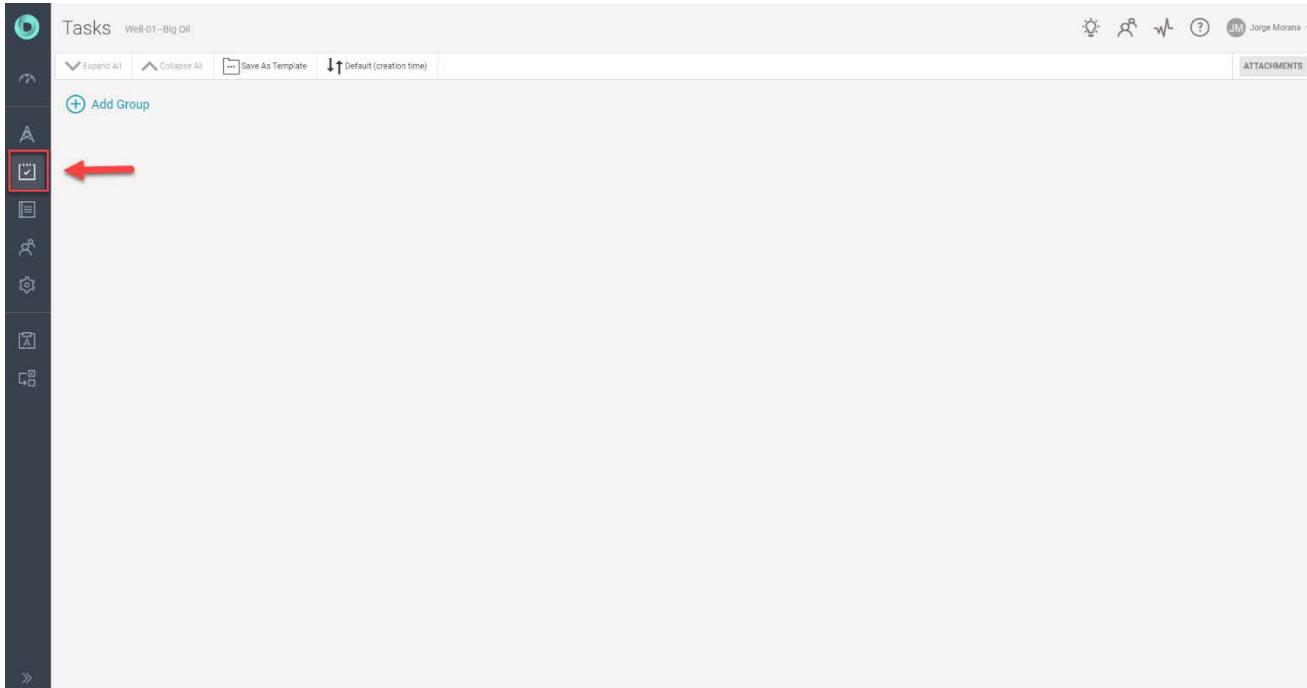
- Jorge_Well-01-Big Oil: 0% complete (highlighted with a red border)
- Loris 14H-Loris Oil & Gas: 97% complete
- Loris 11HC-Loris Oil & Gas: 100% complete

In the 'MY TASKS' section, there's a single task: 'DESIGN SURVEY PROGRAM' with a progress bar at 0%. The 'MY REVIEWS' section is currently empty.

5. To work on a project (well), find the sought-after project in My Projects and select it. This will open the selected project's Tasks page

1.2.1 Add Groups

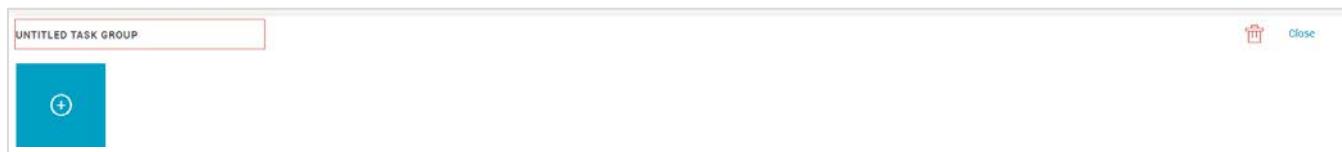
Go to the Tasks page by clicking the  Tasks icon.



Groups can be used to group tasks and to organize the workflow in stages. In most well design or well construction workflows, this will be a sequential and natural way to work through the design from initial feasibility to final design. We are going to base this tutorial material on simplified approach of Groups: SURFACE, WELLBORE and SECTIONS.

First create all the below groups, or, alternatively, you could create your own Groups to better fit your workflows. Creating your own names for these Groups can make them more familiar or follow a company standard.

To add a group, click the Add Group button, type the Group Name and then click on [Close](#) to save the Group. Repeat the same process for all the groups you are intending to create.

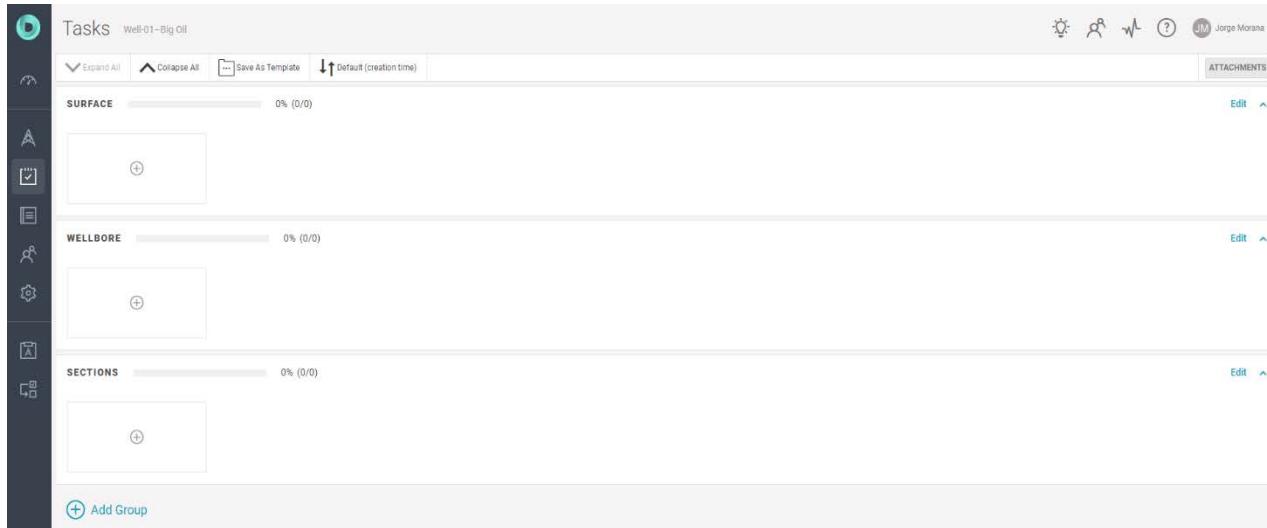


- SURFACE
- WELLBORE
- SECTIONS

After creating all the Groups, the page should now look like this:

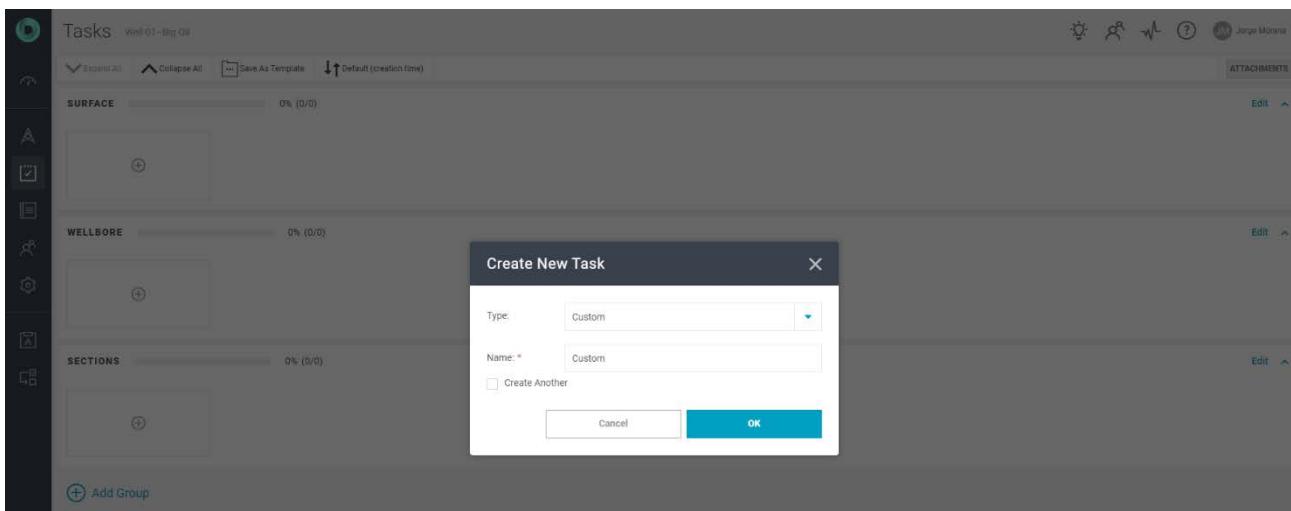
1.2.2 Adding Tasks to a Group

To get access to the Tasks view, go to the main menu of the Project and click the Tasks icon . Here, you can add new Tasks to each Group.



The screenshot shows the 'Tasks' view for the project 'Well-01-Big Oil'. The interface includes a toolbar with 'Expand All', 'Collapse All', 'Save As Template', and 'Default (creation time)' buttons. Below the toolbar are three main sections: 'SURFACE' (0% complete), 'WELLBORE' (0% complete), and 'SECTIONS' (0% complete). Each section has an 'Edit' button. At the bottom left is a 'Add Group' button, and at the bottom right is an 'ATTACHMENTS' button.

1. To add new tasks to a group, click on the Add Task  button in the Group of choice. When you do this the Create New Task dialog box will appear:



The screenshot shows the 'Tasks' view with the 'WELLBORE' group selected. A 'Create New Task' dialog box is open in the center. The dialog has fields for 'Type:' (set to 'Custom'), 'Name:' (set to 'Custom'), and a 'Create Another' checkbox. At the bottom are 'Cancel' and 'OK' buttons. The background shows the 'SURFACE' and 'SECTIONS' groups.

2. In the SURFACE Group, Create New Task dialog box, select the task type
3. Give the task a name
4. Select OK. The task is created under the Group

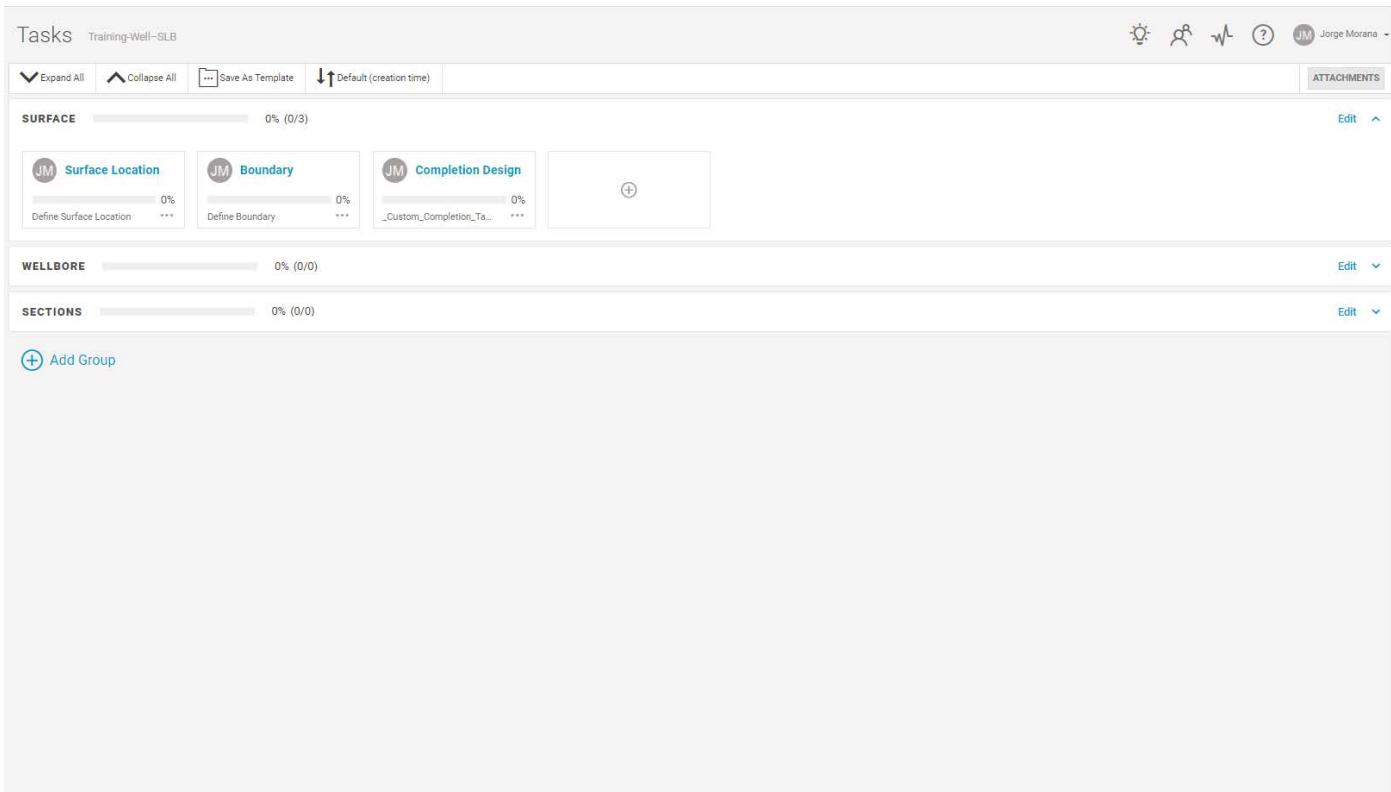
To simplify the multiple task creation, ensure you check the *Create Another* box. This will keep the New Task dialog box open while creating different tasks.

Create the following tasks for the appropriate Groups:

Surface

Task type	Task Name	Assigned to:
Define Surface Location	Surface Location	Instructor
Define Boundary	Boundary	Instructor
(Corp.Deliv)_Custom_Completion_Task	Completion Diagram	Instructor

Once all the tasks have been added, the group will look like this:



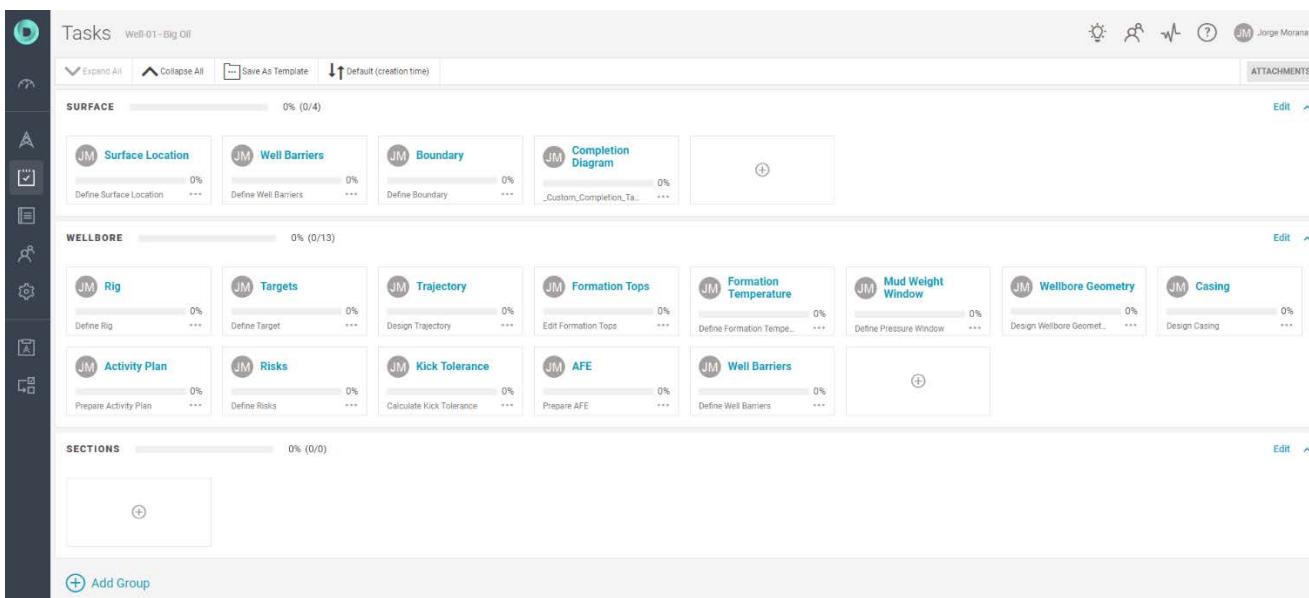
The screenshot shows the DrillPlan Tasks interface for the 'Training-Well-SLB' project. The 'SURFACE' group is expanded, displaying three tasks:

- Surface Location**: Status 0% (0/3), sub-tasks: Define Surface Location, ***
- Boundary**: Status 0% (0/3), sub-tasks: Define Boundary, ***
- Completion Design**: Status 0% (0/3), sub-task: (Corp.Deliv)_Custom_Completion_Task, ***

Below the Surface group, the 'WELLBORE' and 'SECTIONS' groups are shown with 0% completion (0/0). A 'Add Group' button is located at the bottom left. The top right corner shows user information: Jorge Morana.

Wellbore

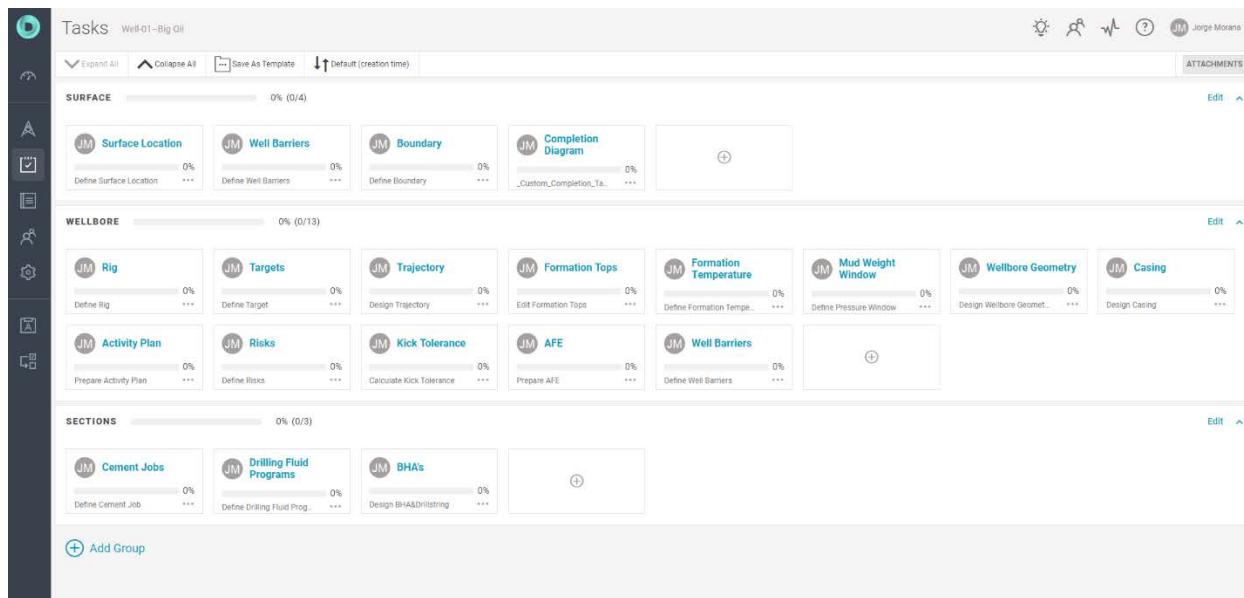
Task type	Task Name	Assigned to:
Define Target	Targets	Instructor
Design Trajectory	Trajectory	Instructor
Edit Formation Tops	Formation Tops	Instructor
Define Formation Temperature	Formation Temperature	Instructor
Define Pressure Window	Mud Weight Window	Instructor
Design Wellbore Geometry	Wellbore Geometry	Instructor
Define Rig	Rig	Instructor
Design Casing	Casing	Instructor
Prepare Activity Plan	Activity Plan	Instructor
Define Risks	Risks	Instructor
Calculate Kick Tolerance	Kick Tolerance	Instructor
Prepare AFE	AFE	Instructor
Define Boundary	Boundary	Instructor



Repeat the same process with the SECTIONS group but with the tasks listed below. Remember to change the task type as required.

SECTIONS

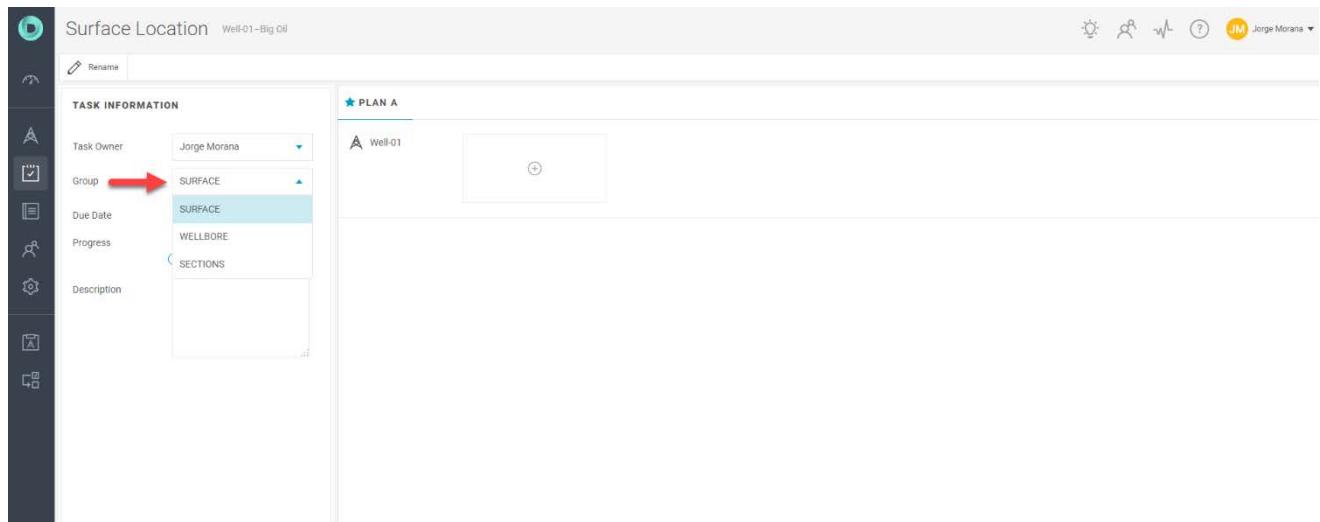
Task type	Task Name	Assigned To:
Define Cement Job	Cement Jobs	Instructor
Define Drilling Fluid Program	Drilling Fluid Programs	Instructor
Design BHA&Drillstring	BHA's	Instructor



The definition of the Corporate Deliverable (Corp. Deliv.) will be introduced later in this training.

You will see we have repeated the Wellhead and BOP task to have it in two groups. The idea with this is to demonstrate how easy it is to customize the tasks pane and, more importantly, to show you later during this training how repeating a task won't interfere with engineering simulations. Those are based on the same object and therefore, once you complete it in one, will be automatically reflected in the second one.

All the new tasks should be placed in the correct group. If they were mistakenly placed in the wrong group, you can change the assigned group once you have navigated in the task. (see below example of changing AFE group assignment)

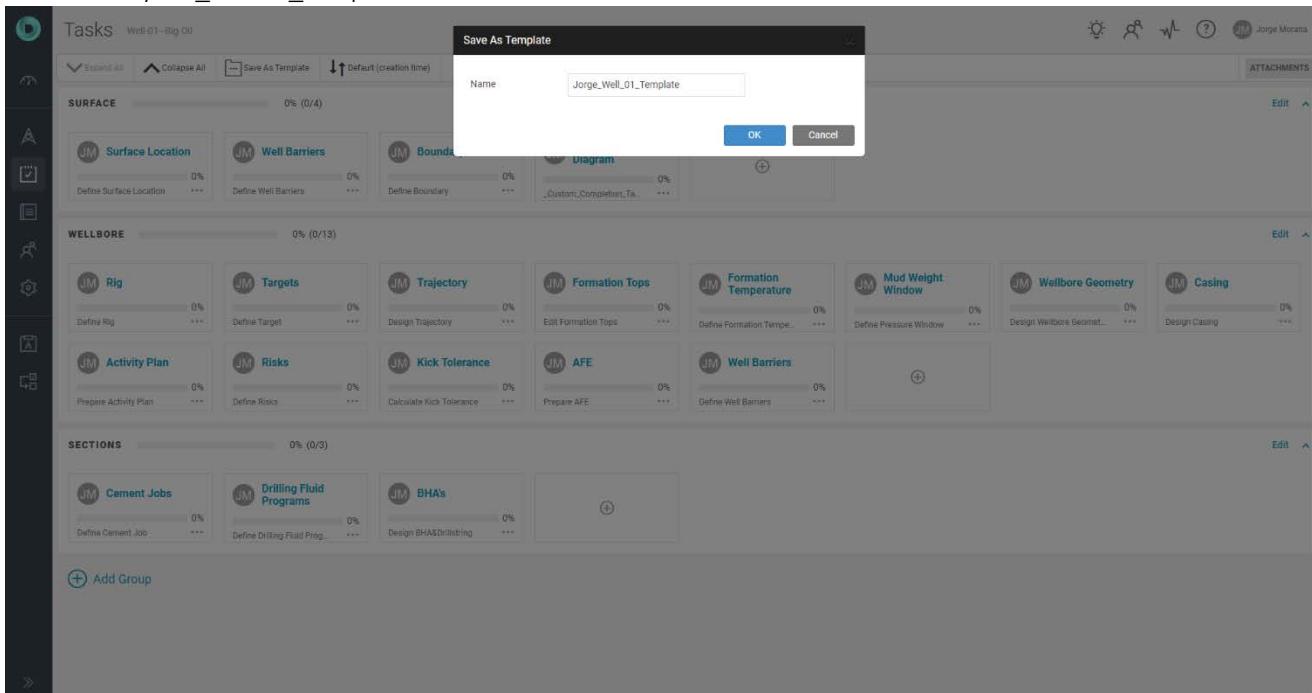


You can now delete the Define Boundary task from the WELLBORE group. To delete a task, click the ellipses "... " on the bottom right corner of the desired task and simply click the Delete Task option.

SURFACE		WELLBORE		SECTIONS	
JM Surface Location	0%	JM Well Barriers	0%	JM Boundary	0%
Define Surface Location	...	Define Well Barriers	...	Define Boundary	...
JM Completion Diagram	0%	JM Trajectory	0%	JM Formation Tops	0%
Custom_Completion_Ta...	...	Design Trajectory	...	Edit Formation Tops	...
JM Rig	0%	JM Targets	0%	JM Formation Temperature	0%
Define Rig	...	Define Target	...	Define Formation Temper...	...
JM Activity Plan	0%	JM Risks	0%	JM Mud Weight Window	0%
Prepare Activity Plan	...	Define Risks	...	Define Pressure Window	...
JM Kick Tolerance	0%	JM AFE	0%	JM Well Barriers	0%
Calculate Kick Tolerance	...	Prepare AFE	...	Define Well Barriers	...
JM BHA's	0%				
Design BHA&Drillstring	...				

This definition process is done only once, when the system is initially setup. Once done, it can be Saved as Template which can easily be used to create new wells with pre-defined Tasks.

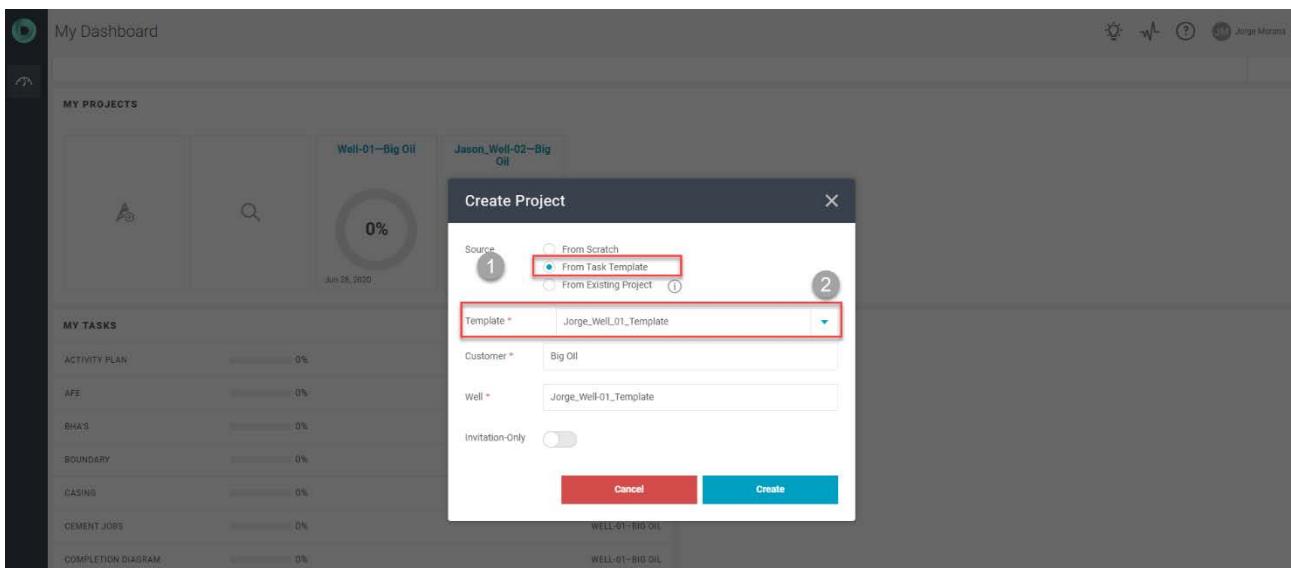
Save as: "your_name" _template



1.2.3 Create a project From Template

Back on the Dashboard page, click  New Project and this will make the Create Project dialog box pop-up.

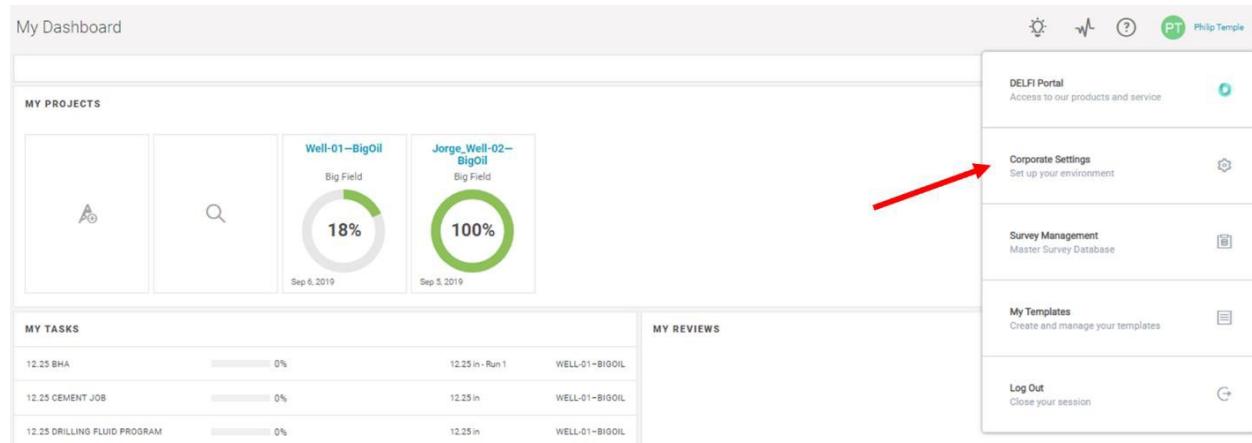
1. In the Create Project dialog box, type the Customer (operator) and Well names
2. Select the source option From Template
3. Search within the available templates, select the appropriate one and then click Create



2 Module 2 – Corporate Settings

The corporate setting section is aimed to provide you with a higher level of customization if you have the correct permissions. Any changes that you make to the corporate settings affect all projects. As of the November 2019 release, the corporate settings are restricted to the corresponding subscription access level. You will be able to work on this section only if you have the correct permissions.

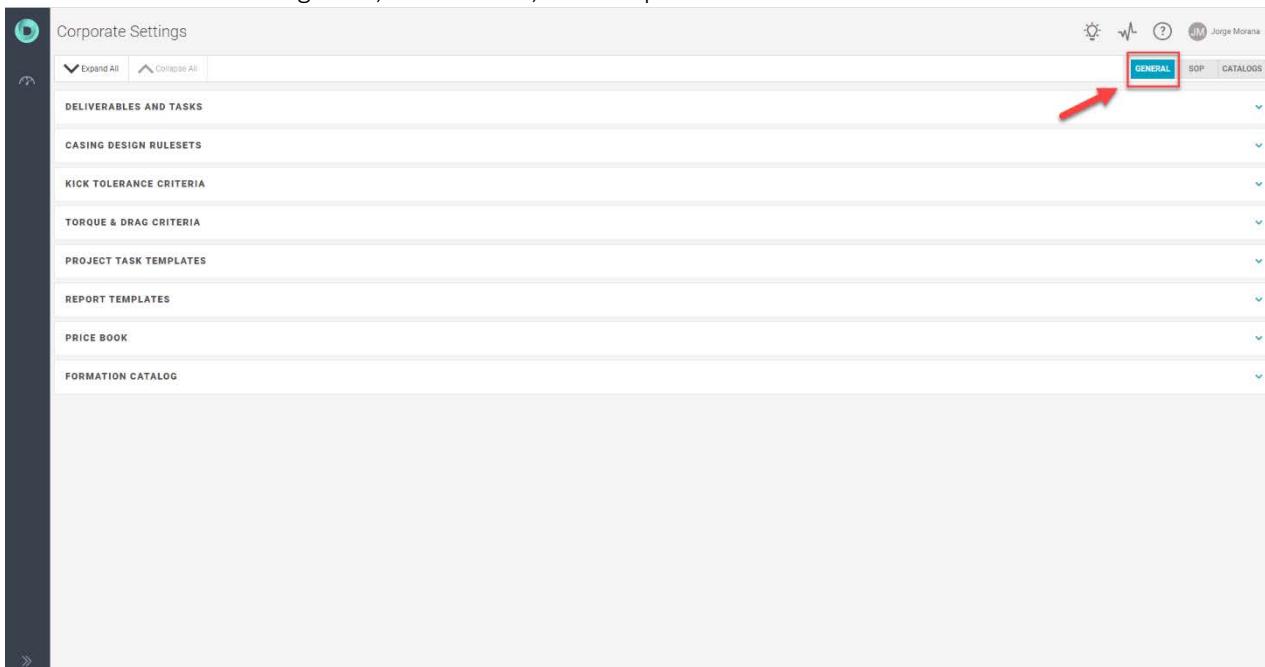
To go to the page, select your name in the upper-right corner, and select Corporate Settings.



The screenshot shows the DrillPlan dashboard. On the right side, there is a vertical menu bar with the following options:

- DELFI Portal (Access to our products and service)
- Corporate Settings** (Set up your environment) - This option is highlighted with a red arrow.
- Survey Management (Master Survey Database)
- My Templates (Create and manage your templates)
- Log Out (Close your session)

You can see the existing tasks, deliverables, and templates in the relevant sections of the “General” tab.

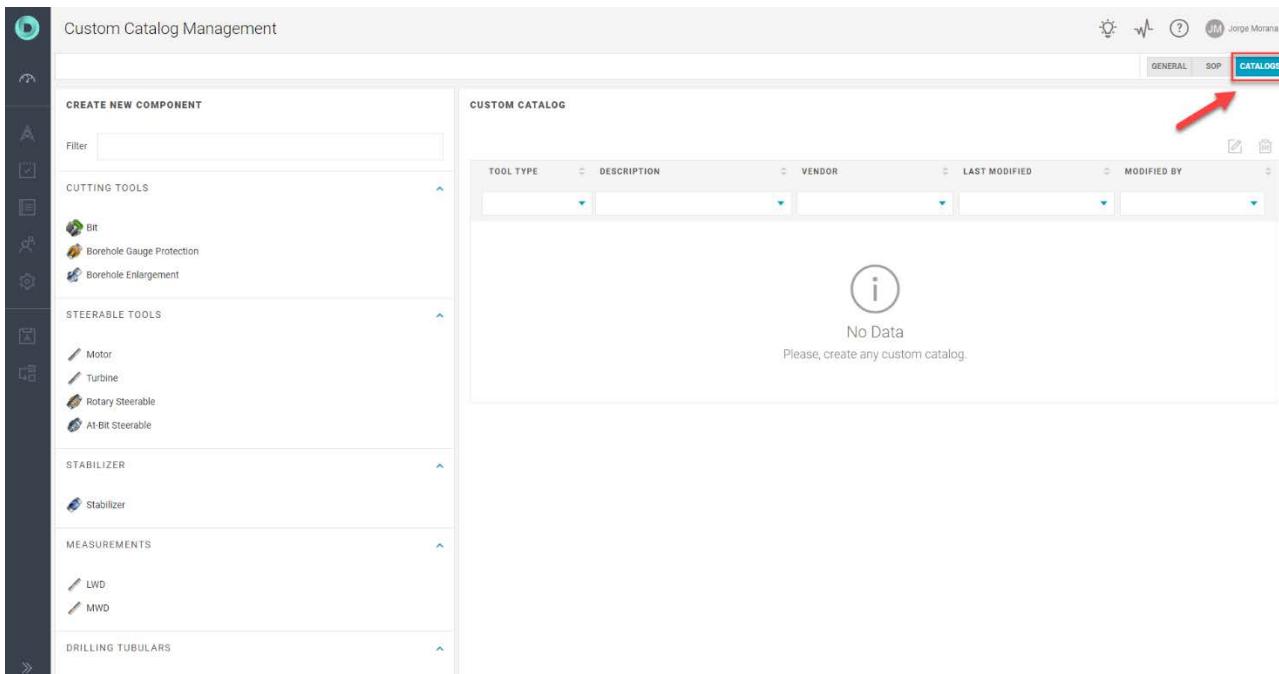


The screenshot shows the 'Corporate Settings' page. On the left, there is a sidebar with the following categories:

- DELIVERABLES AND TASKS
- CASING DESIGN RULESETS
- KICK TOLERANCE CRITERIA
- TORQUE & DRAG CRITERIA
- PROJECT TASK TEMPLATES
- REPORT TEMPLATES
- PRICE BOOK
- FORMATION CATALOG

At the top right, there are tabs labeled GENERAL, SOP, and CATALOGS. The 'GENERAL' tab is highlighted with a red box and a red arrow pointing to it.

You can also see the custom catalog in the Catalogs view.



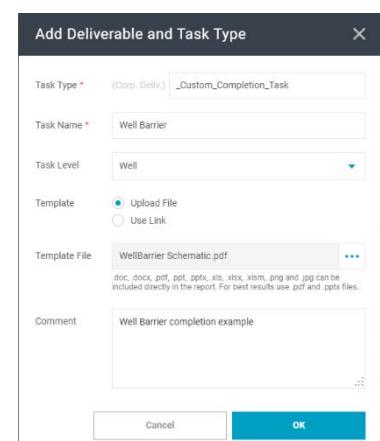
In the General section of the Corporate Settings, you can customize your Deliverables and Tasks.

[Go back to the “General” Tab in the Corporate Setting page](#)

You can manage corporate tasks and deliverables from the Corporate Settings page. Corporate tasks are available to all projects on the same site and appear in the task list when you add a task. The main purpose of these corporate tasks is to create an “object” which will be enabled by the Review/Approve process, it will hold the external template placeholder (for documents to be attached/include) and this object will then be automatically available to be consumed by the Report Task.

To create a corporate deliverable on the task editor page of a corporate task:

1. On the task editor section within Deliverables and Tasks, select  Create New to create a new corporate deliverable
2. In the New dialog box, enter:
3. Task Type: _Custom_Completion_Task
4. Task Name: “Well Barrier”
5. Task Level: Well
6. Template: “Upload File”
7. Template File: Pick the “WellBarrier Schematic.pdf” provided in the data set
8. Comment: “Well Barrier completion example”
9. Select OK



Now try adding a corporate deliverable for the Well Barrier diagrams.

With this, the corporate deliverable is created, and it will appear in the Deliverables and Tasks sub-section.

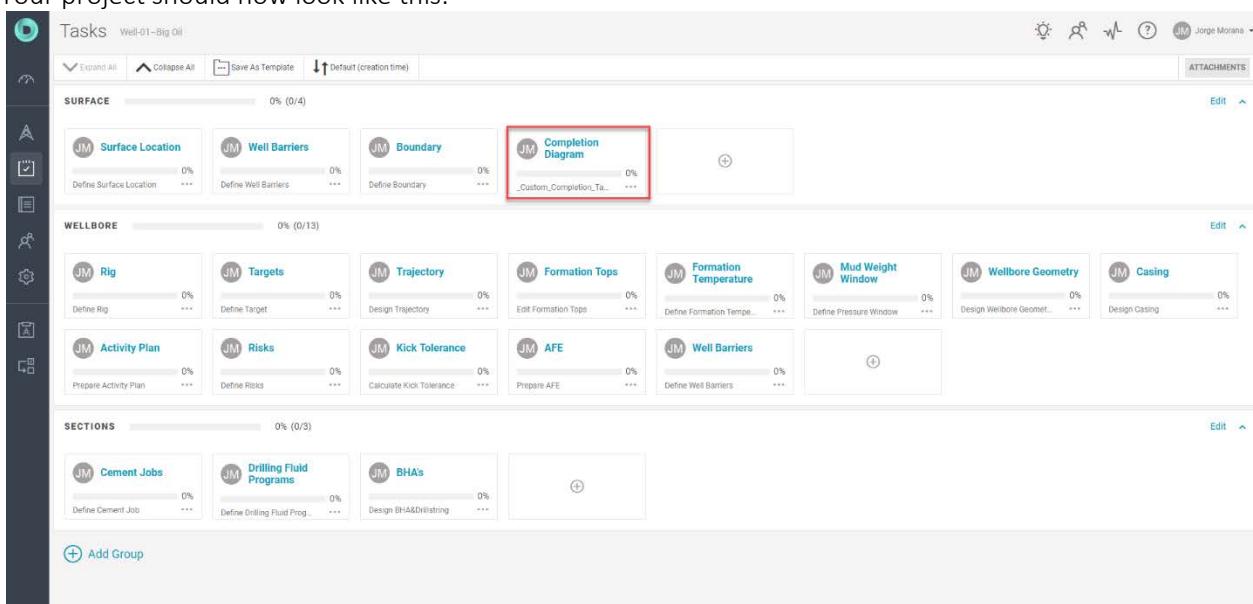
Create Corporate Task

In your project Task page, you can add a new task (similarly to how it was done in the previous section but now selecting this newly created task from the Type list).

Now add a new task:

Engineering	
Task type	Task Name
_Custom_Completion_Task	WellBarrier Diagrams

Your project should now look like this:



The screenshot shows the 'Tasks' page for the 'Well-01-Big Oil' project. The tasks are organized into three main sections: SURFACE, WELLBORE, and SECTIONS.

- SURFACE:** Contains tasks like Surface Location, Well Barriers, Boundary, and Completion Diagram. The 'Completion Diagram' task is highlighted with a red box.
- WELLBORE:** Contains tasks like Rig, Targets, Trajectory, Formation Tops, Formation Temperature, Mud Weight Window, Wellbore Geometry, Casing, Activity Plan, Risks, Kick Tolerance, AFE, and Well Barriers.
- SECTIONS:** Contains tasks like Cement Jobs, Drilling Fluid Programs, BHAs, and BHA&Drillstring.

A sidebar on the left provides navigation and search functions. The top right corner shows the user's name, Jorge Morana.

We will come back with more details on how to user this option later on the training using both: Completion Design and WellBarrier Diagrams tasks.

Corporate load case designs

You can define the mandatory load cases that are applied to all casing design objects. The table lists the defined corporate load cases that you can apply to all existing and new casing design objects on the same site. It contains the following load case information:

- Name
- Internal and external pressure profile
- Temperature profile
- Well configuration

- Casing type

Additionally, you can add default load cases as required by your specific requirements and/or company policies and standards.

Corporate templates

Corporate templates are available to all projects on the same site and appear in the template list when you create a project.

In the Corporate settings page, select Project Templates to expand the section. You can import, export, or delete corporate project templates.

You can type search terms to find a corporate template in the table. The list automatically updates to show the templates that match the text.

Corporate price books

You can add and update corporate price books on the Corporate Settings page, if you have the correct permissions. Corporate price books are available to all projects on the same site.

Custom components

You can manage custom components from the Catalogs view of the Corporate Settings page. In the Catalogs view of the Corporate Settings page, you can create, edit, or delete a custom component.

Custom components are available to all projects on the same site. You can select them along with public catalog components when you create a casing design or BHA, for example.

Create an SOP template

You can create a standard operation procedure (SOP) template on the Corporate Settings page and generate the activity plan based on the selected SOP template in the Project Settings.

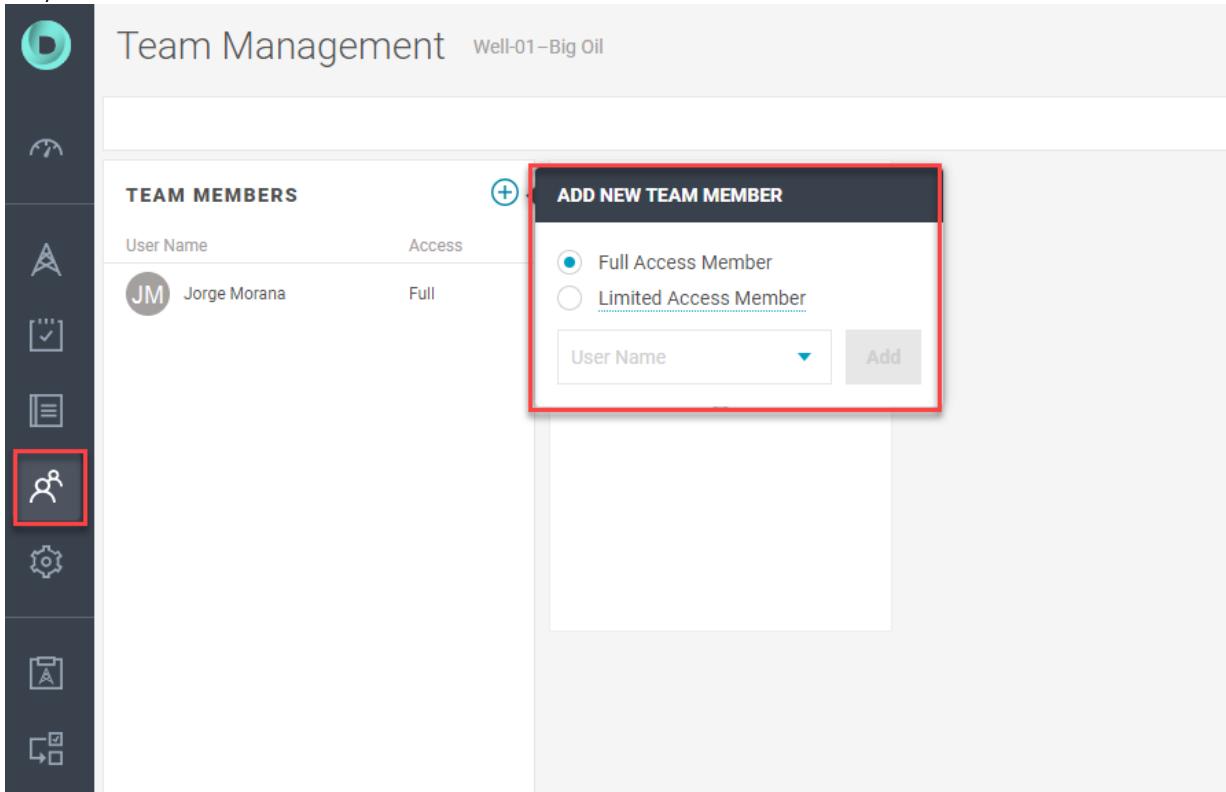
- On the Corporate Settings page, in the SOP view, select  New Template
- In the New Template pane, edit the Template Name, and enter a Description
- Search for the activity by typing the key words in the Activity List box
- Select an activity in the Activity List, and in the rightmost pane, edit the activity Notes and Time, ROP, or Speed, as applicable
- Select  Add Attachment to add an attachment for the current activity
- To add a specific section in the SOP, select  Add Hole-Size-Specific Construct Section next to the Activity List
 - In the Add Construct Section dialog box, enter the Section size
 - In the Copy from list, select an existing section in the SOP to use as the default template for the section
 - Click Add to add the specified section in the SOP
- You can edit the section based on an existing SOP in the Construct well tree
- To delete an SOP template from the Templates list, point to the SOP template and select 

3 Module 3 – Collaboration

3.1 Add/Remove Members

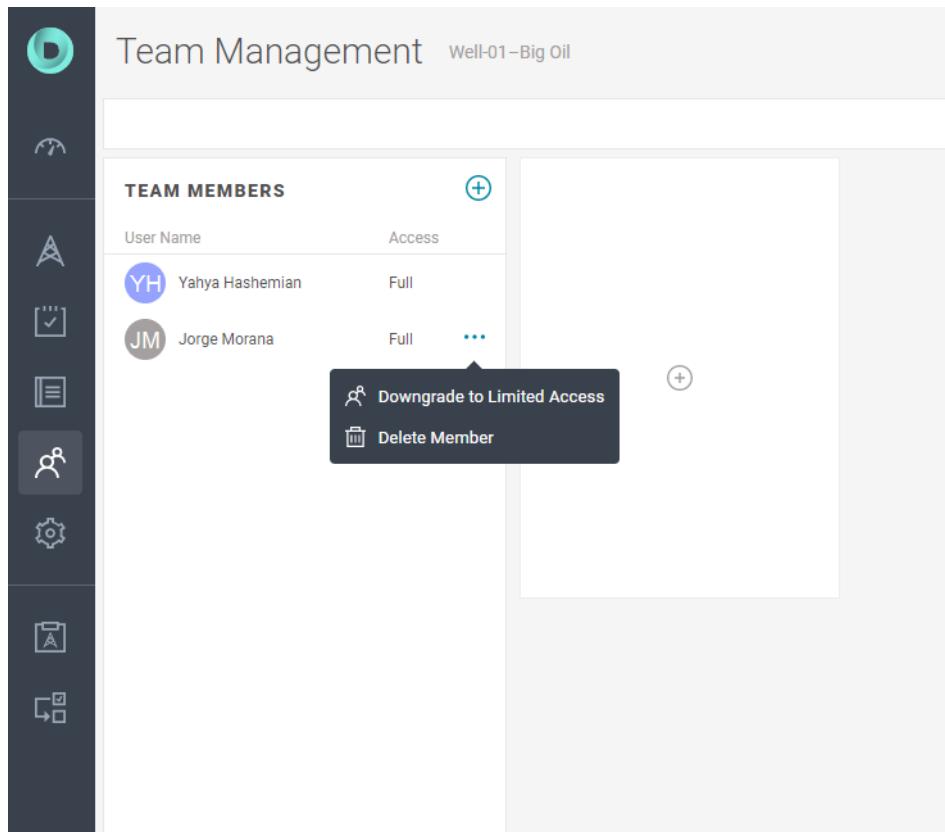
All tasks created are now assigned to you and you have 0% progress in each of them. To add team members to the project, select the Team Management view  and on the Add user box type the name of the users you wish to add to the team. Once you have found the user, click on the person's name to make them part of the team.

Coming in the latest releases, DrillPlan handles two types of team members: Full Access Members and Limited Access Member. Full access members can be modified any task in any given time, but Limited access member, only can see.



The screenshot shows the DrillPlan application interface. On the left is a vertical toolbar with icons for Home, Dashboard, Projects, Reports, Team Management (which is highlighted with a red border), Settings, Drills, and Help. The main area is titled "Team Management" and "Well-01-Big Oil". Below this, there is a table titled "TEAM MEMBERS" with one row: "JM Jorge Morana" under "User Name" and "Full" under "Access". A modal window titled "ADD NEW TEAM MEMBER" is open over the table. It contains two radio buttons: "Full Access Member" (selected) and "Limited Access Member". Below these is a "User Name" input field with a dropdown arrow and an "Add" button. The entire "ADD NEW TEAM MEMBER" modal is highlighted with a red border.

To remove a user, click the ellipses, or three dots, next to the team member you wish to remove and then click on the “delete member” button that appears to the right of the team member name. Similarly, to change the access level of a team member, click the ellipses next to the team member and then click on the button to downgrade or upgrade access.



TEAM MEMBERS

User Name	Access
YH Yahya Hashemian	Full
JM Jorge Morana	Full

⋮

Downgrade to Limited Access

Delete Member

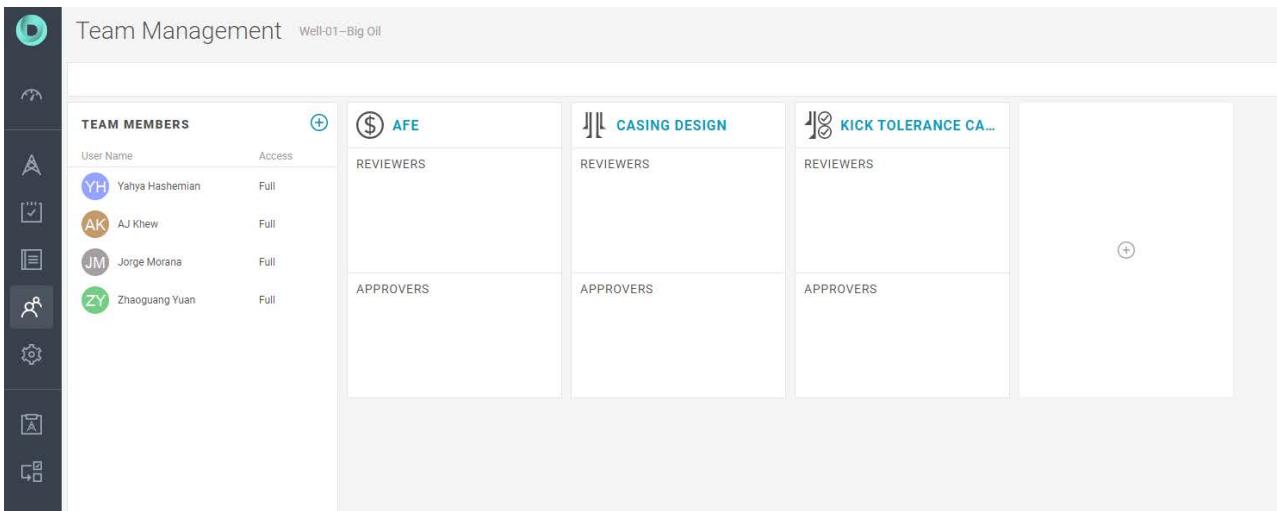
If you have defined your well to be as per Invite-Only, then this is the section where you will need to add any team member you would like to have as part of the project.

3.2 Roles assignment

On the Team Management page, you can assign reviewers and approvers to the different well planning deliverables. Add the desired deliverable (like AFE, Mud design, etc.) by clicking on the  button, the Add Object Type window appears. Select the object type and then click OK.

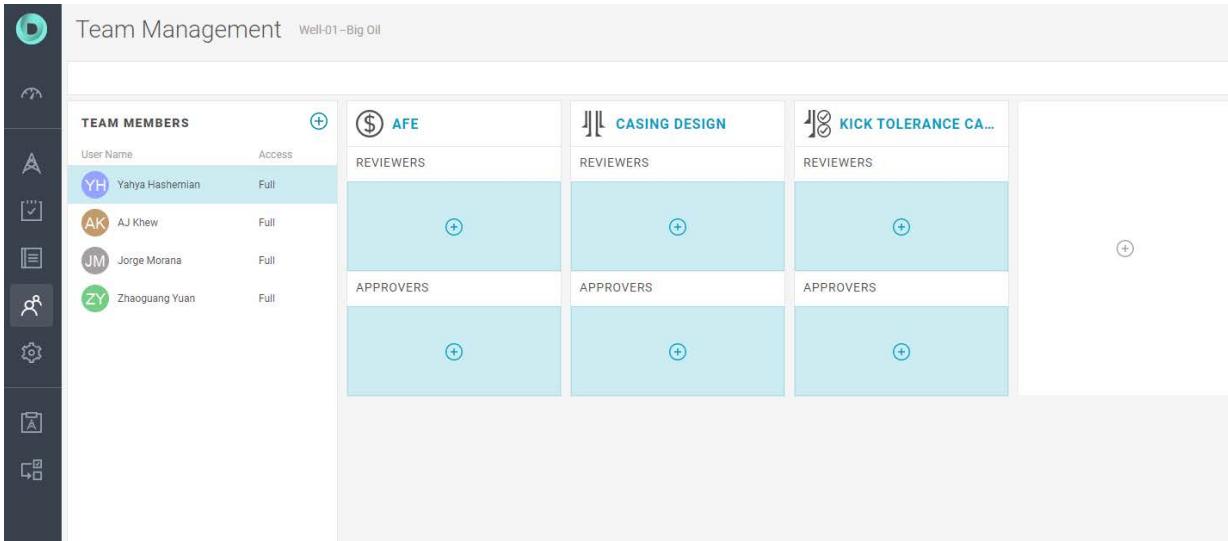
Try now adding three (3) objects/tasks:

- AFE (only available for those with the correct subscription)
- Casing Design
- Kick Tolerance Calculations



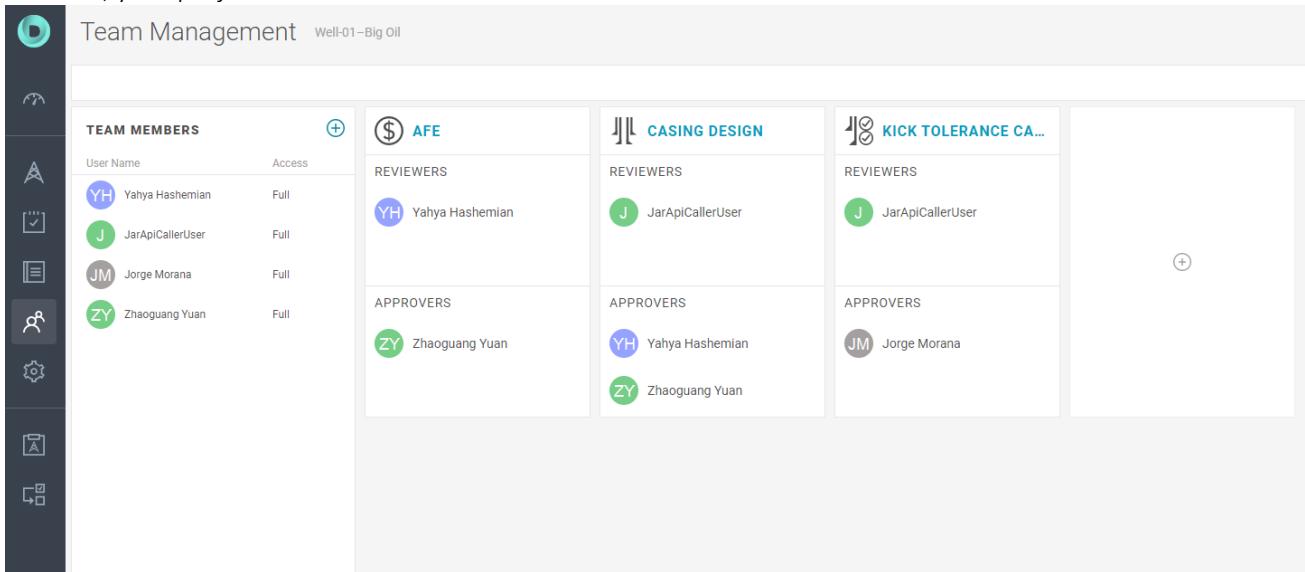
The screenshot shows the 'Team Management' page for 'Well-01-Big Oil'. On the left is a sidebar with various icons. The main area has a table titled 'TEAM MEMBERS' with four rows of users: YH (Yahya Hashemian), AK (AJ Khew), JM (Jorge Morana), and ZY (Zhaoguang Yuan), all with 'Full' access. To the right are three columns: '\$ AFE', 'CASING DESIGN', and 'KICK TOLERANCE CA...'. Each column has two sections: 'REVIEWERS' and 'APPROVERS', both currently empty. There is a large '+' icon at the bottom right of the table area.

Now, assign some Reviewers and Approvers from your peers. To do it, select a team member name and then click on the Object “+” sign for either a Reviewer or Approver. For each object/task, you can have multiple Reviewers and/or Approvers. Keep in consideration that a task owner cannot be reviewer or approver of the same task.



This screenshot shows the same 'Team Management' page after roles have been assigned. The 'TEAM MEMBERS' table remains the same. In the 'AFE' column, the 'REVIEWERS' section now contains a '+' sign. In the 'Casing Design' and 'Kick Tolerance' columns, the 'REVIEWERS' sections also contain a '+' sign. The 'APPROVERS' sections in all three columns are empty. The large '+' icon at the bottom right is still present.

At last, your project will look like this:



The screenshot shows the DrillPlan Team Management interface for a project titled "Well-01-Big Oil". On the left is a sidebar with various icons. The main area displays three tasks: "AFE", "CASING DESIGN", and "KICK TOLERANCE CA...". Each task has sections for "REVIEWERS" and "APPROVERS", each listing four users with their initials and names.

TEAM MEMBERS	User Name	Access
 YH Yahya Hashemian	Full	
 J JarApiCallerUser	Full	
 JM Jorge Morana	Full	
 ZY Zhaoguang Yuan	Full	

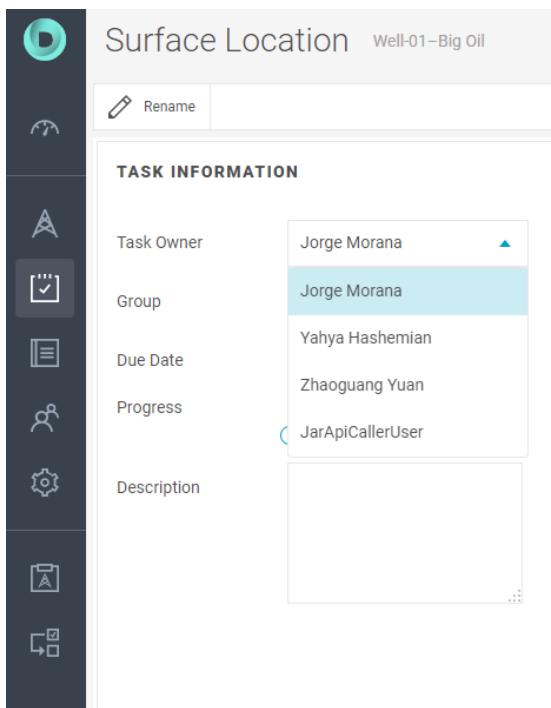
\$ AFE	CASING DESIGN	KICK TOLERANCE CA...
 YH Yahya Hashemian	 J JarApiCallerUser	 J JarApiCallerUser
 ZY Zhaoguang Yuan	 YH Yahya Hashemian	 JM Jorge Morana

3.3 Assign tasks, add description and set progress

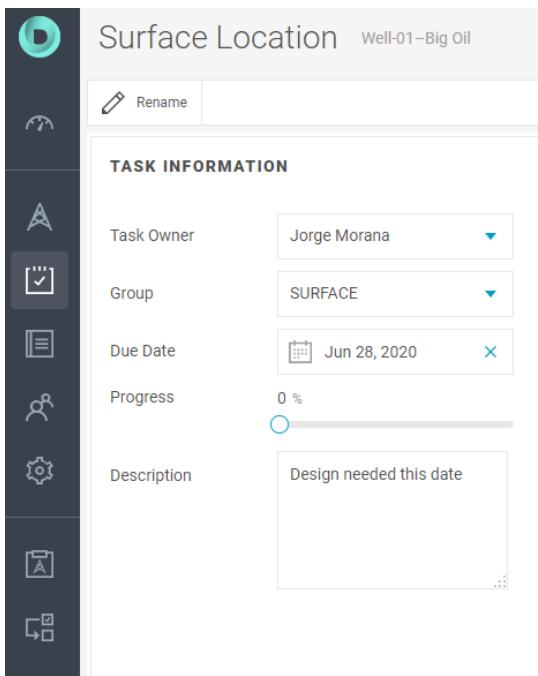
Now that the project has more team members, you can start to assign tasks to them. Within each task, users can also add a description and a progress. One thing to keep in mind when assigning tasks to a team member is that if the progress is not 100%, the task will appear in the team member's dashboard as a pending item.

It is also a good idea to add a description to the task. This description is to effectively communicate what to do and what to remember when doing the task.

To assign a task to a team member go to Tasks page. Then, select the BHA's task under the SECTIONS group, the following appears. The Owner drop down list contains the team members just added to the project.

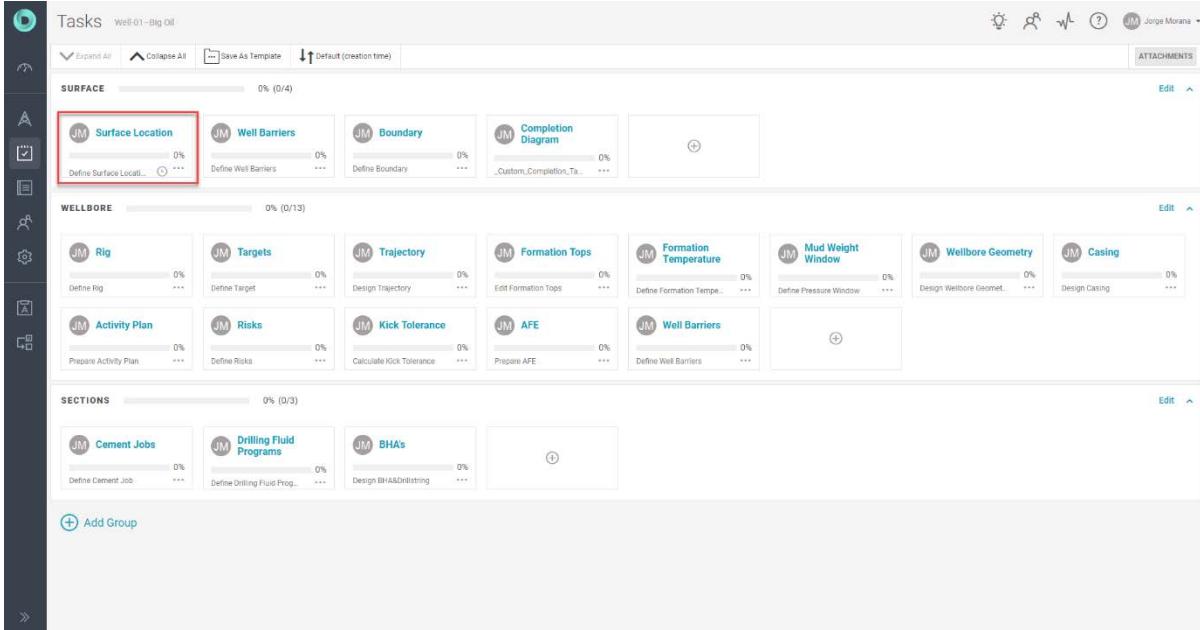


Change the owner to any of your team members, add a short description in the text box available on the right side and set the Due Date.

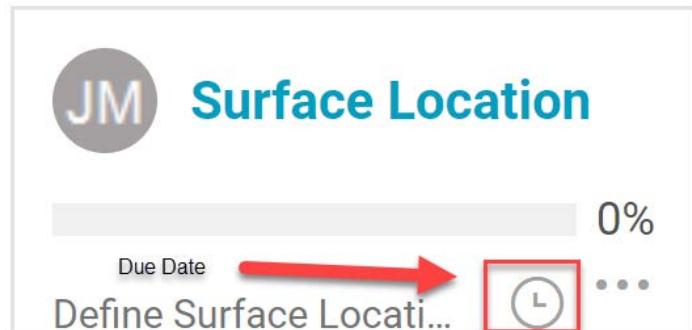


You cannot set a due date for a task once the progress bar is set to 100%.

When you have a due date set, a clock icon will be shown on the task card in the Task page. To quickly view the due date, hoover your mouse over the clock icon and the date will show up.

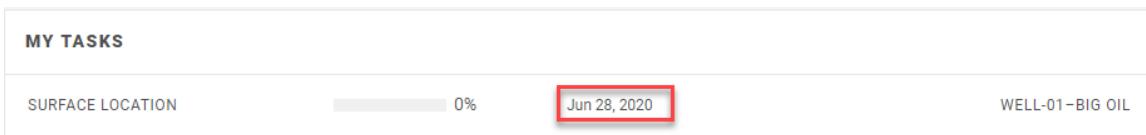


The screenshot shows the DrillPlan Tasks page for Well-01-Big Oil. The tasks are organized into three main sections: SURFACE, WELLBORE, and SECTIONS. The SURFACE section contains four tasks: Surface Location, Well Barriers, Boundary, and Completion Diagram. The WELLBORE section contains eight tasks: Rig, Targets, Trajectory, Formation Tops, Formation Temperature, Mud Weight Window, Wellbore Geometry, and Casing. The SECTIONS section contains three tasks: Cement Jobs, Drilling Fluid Programs, and BHA's. The Surface Location task card is highlighted with a red box. It shows a progress bar at 0%, a Due Date of Jun 28, 2020, and a clock icon with a red arrow pointing to it. Other task cards in the list also have clock icons.



This is a zoomed-in view of the Surface Location task card from the previous screenshot. The card has a grey header with the JM logo and the title "Surface Location". Below the title is a progress bar showing 0%. Underneath the progress bar, the text "Due Date" is followed by a red arrow pointing to a clock icon. The text "Define Surface Locati..." is partially visible. The clock icon is highlighted with a red box.

This task will now appear in your main DrillPlan Dashboard with dates shown black (on time but pending action) or red (due date passed and still pending action).



This screenshot shows the DrillPlan Dashboard under the "MY TASKS" tab. It lists a single task: "SURFACE LOCATION" with a progress bar at 0% and a due date of "Jun 28, 2020". The due date is highlighted with a red box. The task is associated with "WELL-01-BIG OIL".

3.4 Add project attachments

You can add attachments to a project. This is key when you are collaborating with multiple people on various aspects of a project and particularly when sharing information from different sources. The attachment board is not linked to any particular task/object and is intended to be used as a common and relevant file sharing system without the need of any other file sharing solution with access restrictions.

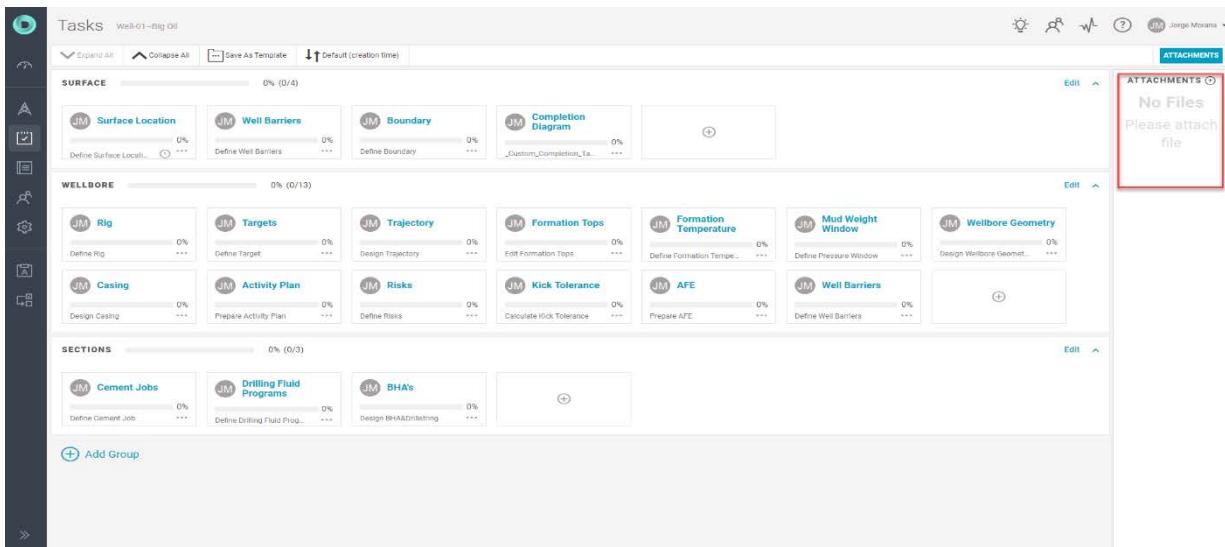
The maximum file size for each attachment is 30MB and the system supports the most commonly used file formats.

3.4.1 Task Level Attachment management

Go to the Tasks page, by clicking the Tasks icon 

Switch on the Attachments panel on the right side.

Drag the attachment file to the Attachments panel. Alternatively, you can click  and select the file to be attached. You can see the progress of uploading



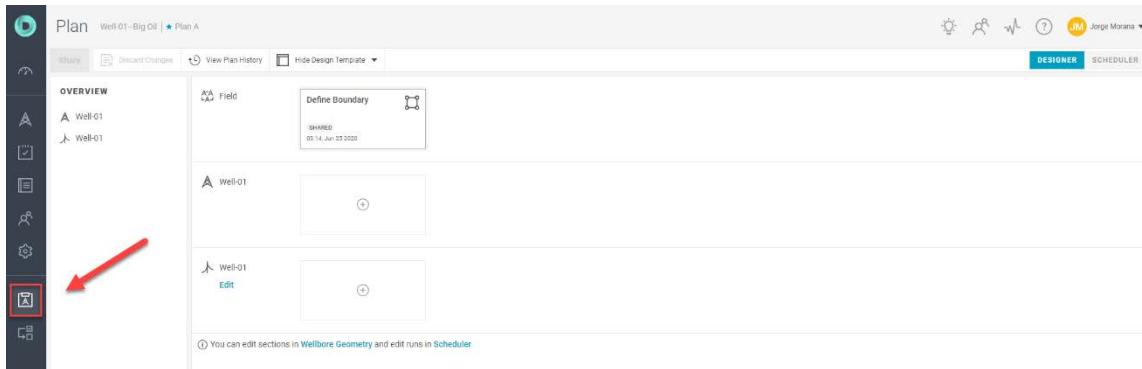
The screenshot shows the DrillPlan Tasks page for a project named 'Web-01-Big Oil'. The main area displays tasks categorized into three sections: SURFACE, WELLBORE, and SECTIONS. Each section contains several tasks with their names, current status (e.g., 0% complete), and a brief description. On the right side of the screen, there is a vertical sidebar with a red border containing the 'ATTACHMENTS' panel. The panel has a header 'ATTACHMENTS' with a circular badge showing '0'. Below it, a message says 'No Files' and 'Please attach file'. There is also a small circular icon with a plus sign inside it.

3.4.2 Object Level Attachment Management

At the object level, the attachment capability is supported for: Trajectory, Kick Tolerance, Casing Design, Mud weight window, Targets, Wellbore Geometry and BHA.

4 Module 4 – Well construction planning workflows (Well Planner View)

Before conducting any well planning workflows, loading data will be required to complete the process.

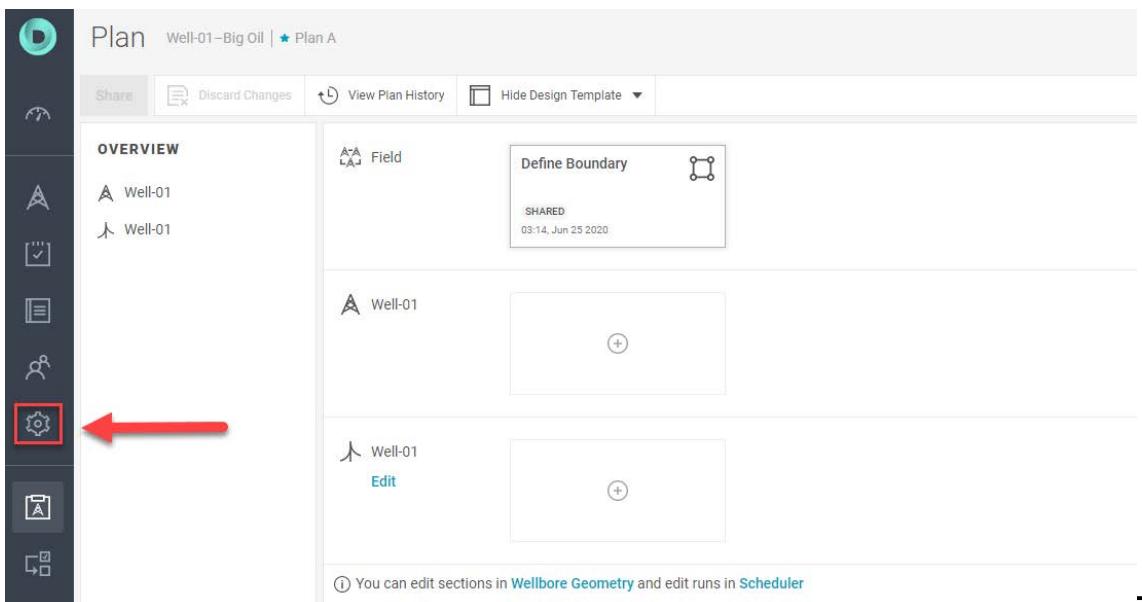


Go to the Plan page icon , and you should see the following:

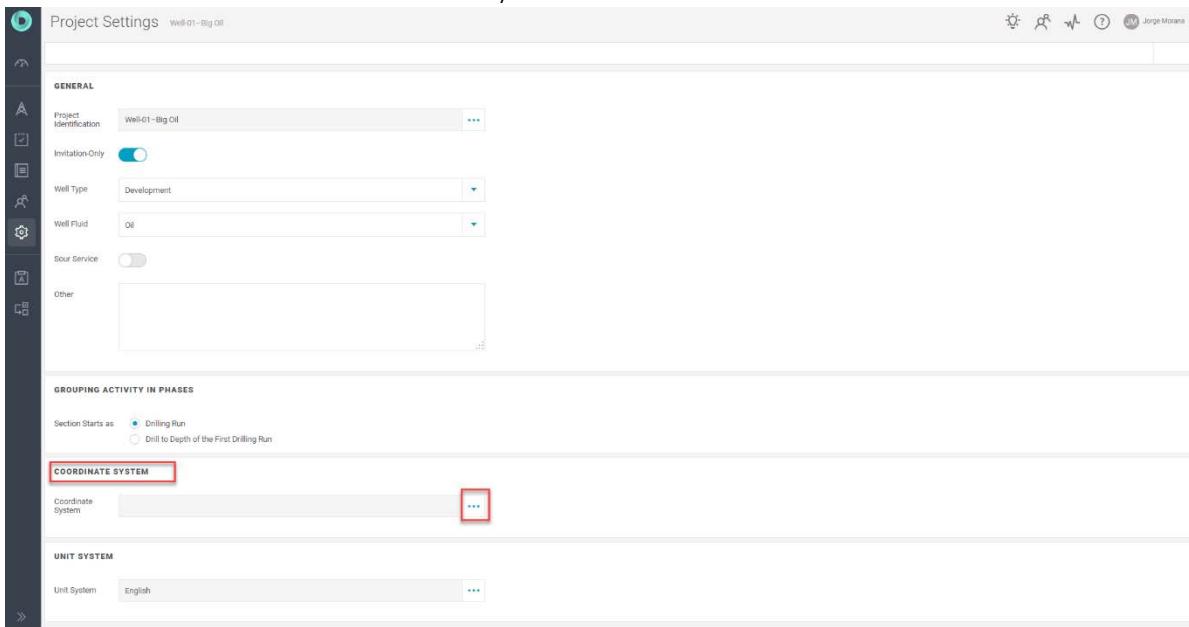
4.1 Defining the CRS at the project level

It is a good practice to start defining the Coordinate reference system, once the project or Well has been created.

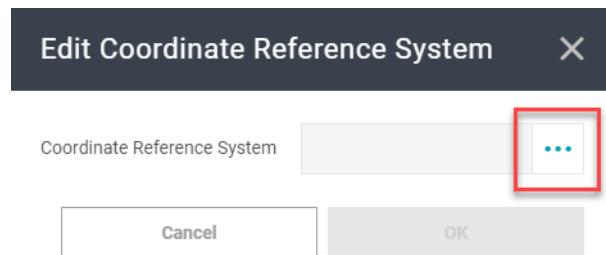
1. Go to the gear icon in your main menu



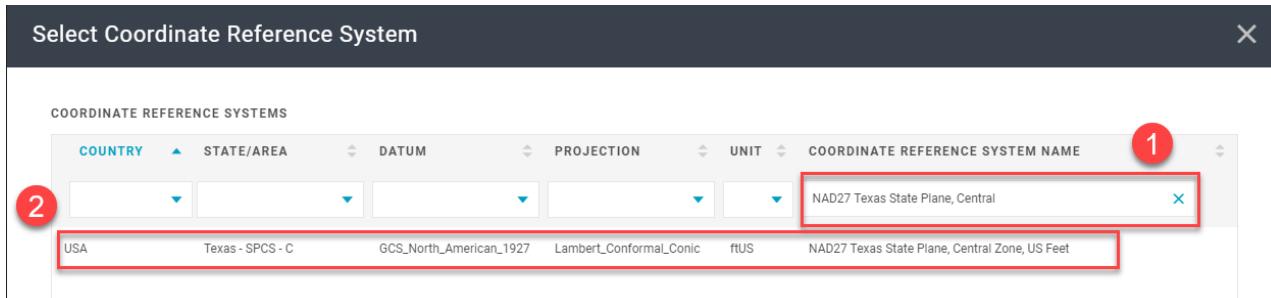
3. Go to the Coordinate System section and click the icon



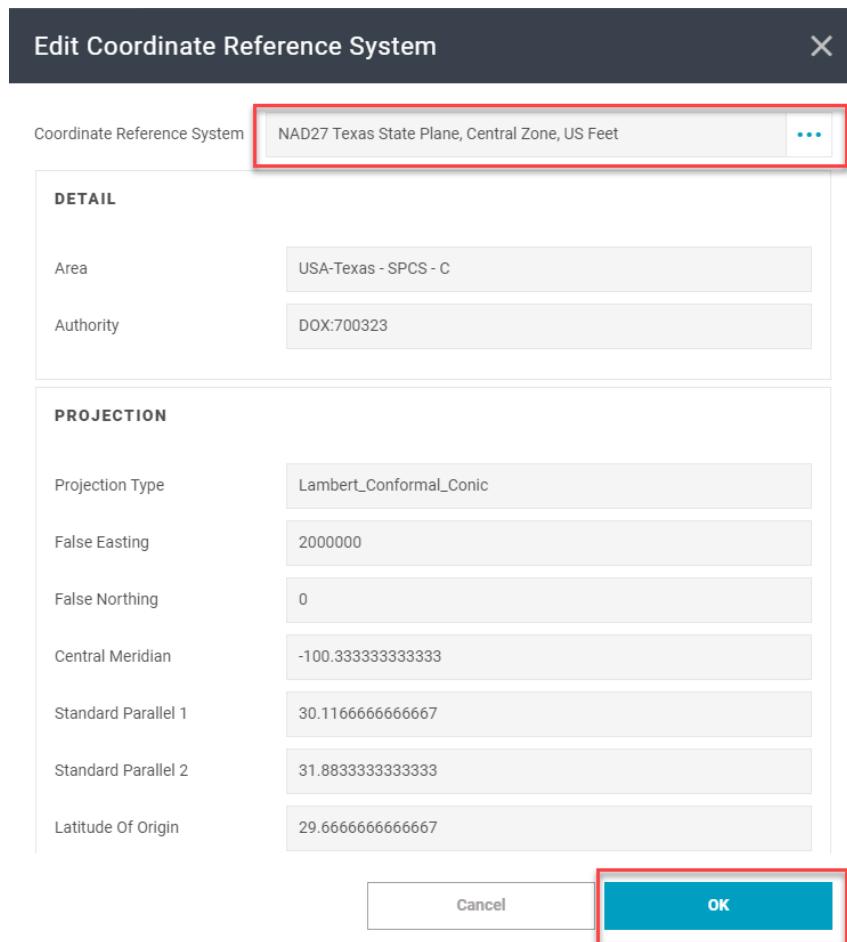
3. A popup window will show up



4. A table with the reference systems available will appear and then, first, go the filtering box indicated, start to type the CRS needed “NAD27 Texas State Plane, Central”; second, select the filtered CRS.



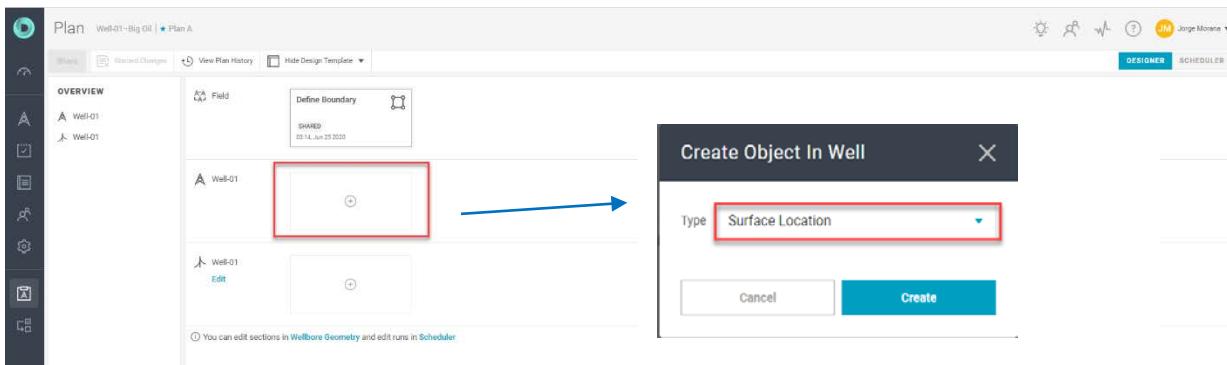
5. A popup windows will show up with the summary of your selection. Review that this is the right choice.



4.2 Surface Location

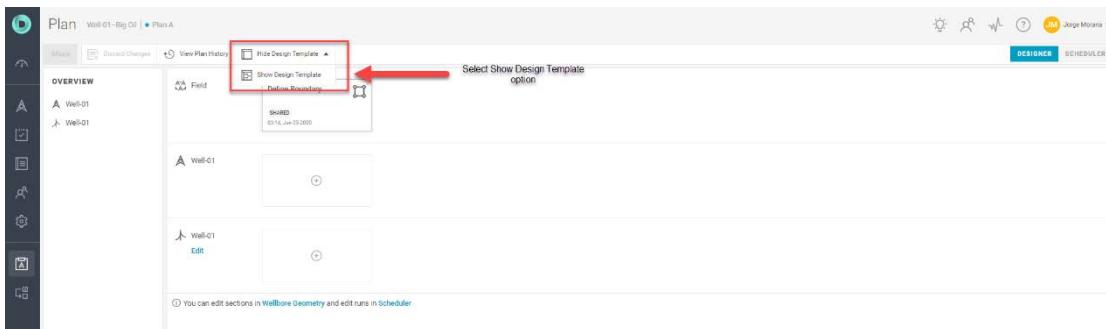


1. Go to the plan view,
2. Click on the plus sign icon, at the Well level (Hide Design Template Option selected by default) and Select surface location object:

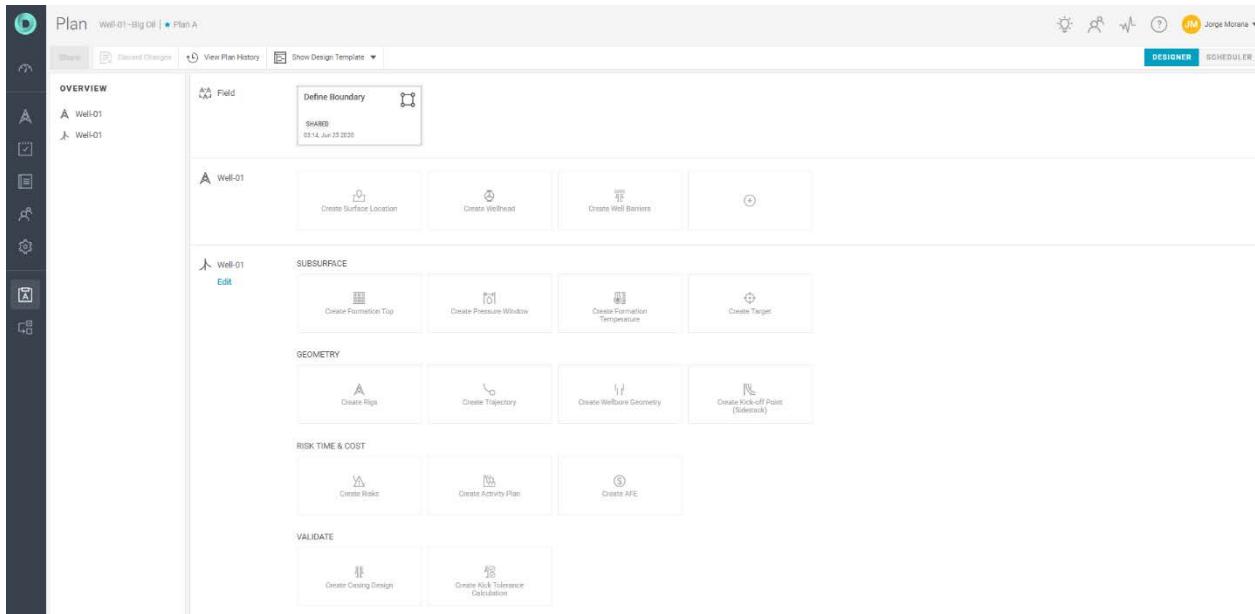


Or Using "Show Design Template"

Click on the menu task bar and choose "Show Design Template"

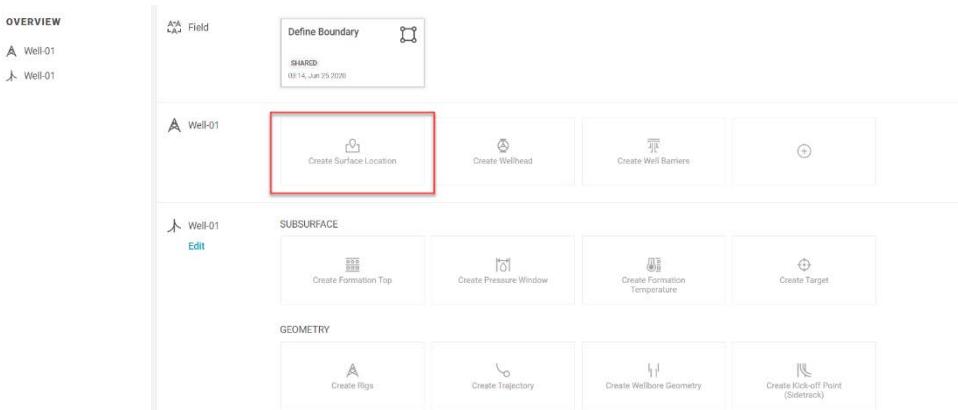


Now you have a view of all object available on the “Plan View”, at the Field, Well, and Wellbore level



We will be using this mode for now on, to continue to complete our project

Click on the “Create Surface Location” Object, that at the moment is showing with a gray out color (it means has not been created)



If you already selected the CRS, skip this step, and go to the next page, step 3

In case you haven't selected the CRS system yet, by clicking on the Edit Coordinate Reference System window appears, then click on the button to access the coordinate catalog. To filter the Coordinate Reference System, you can type the CRS name or partial name in the filter dialog.

Select the **NAD27 Texas State Plane, Central Zone, US feet**, as shown below and click OK.

Surface Location DRAFT Well-01-Big Oil | Plan A

Share Save Rename View History Discard Draft Assign to Slot/Well UnAssign to Slot/Well

GENERAL

Country:
State:
County:
City:

Area:
Field:
Structure:

COORDINATE REFERENCE SYSTEM:
NAD27 Texas State Plane, Central Zone, US Feet

ELEVATION
Ground Level (above MSL) 0.00 ft Edit

COORDINATES

Coordinate System * NAD27 Texas State Plane, Central Zone, US Feet

Coordinate Type Grid Geodetic

Northing * Field is required

Easting * Field is required

Latitude - dega

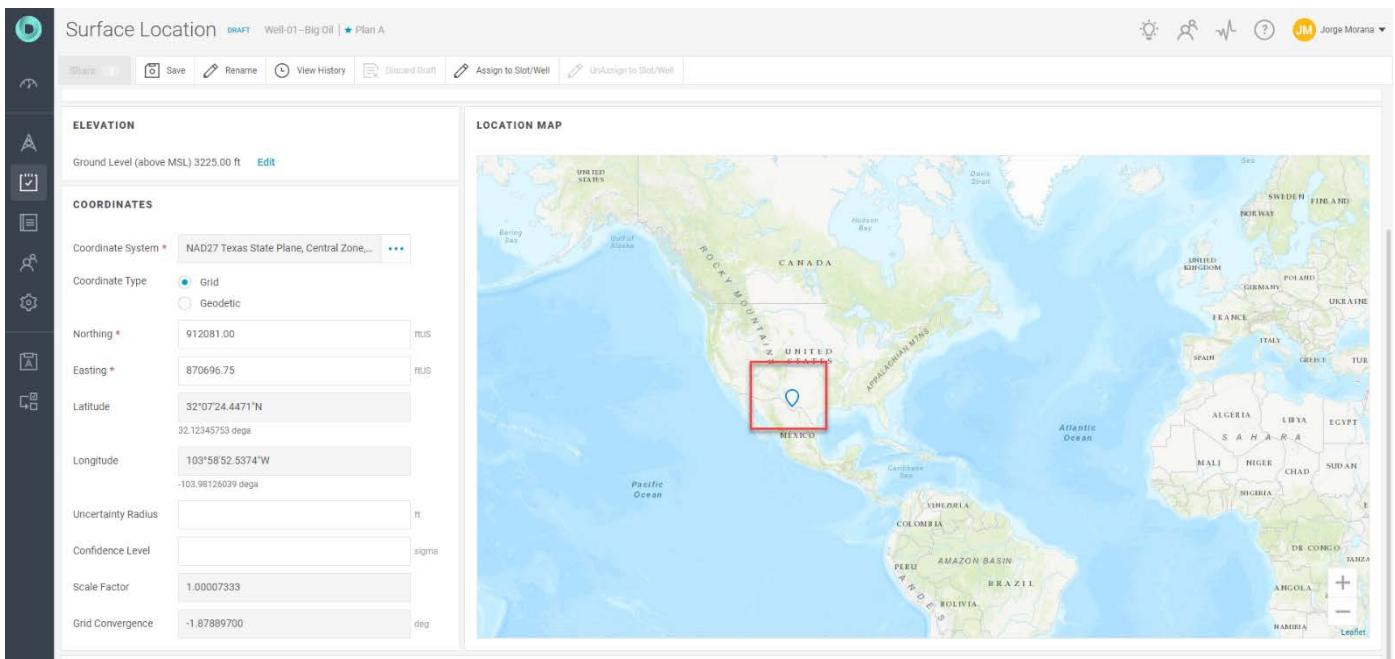
Longitude - dega

LOCATION MAP



3. Enter values for the Northing and Easting in the boxes as shown below:

Field	Big Field
Country	USA
State	New Mexico
Coordinate type	Grid
Northing	912081 ftUS
Easting	870696.75 ftUS
GL	3225 ft
Rotary Kelly Bushing	30 ft



The screenshot shows the DrillPlan software interface for a 'Surface Location' draft named 'Well-01-Big Oil | Plan A'. The left sidebar contains various icons for file management, sharing, and settings. The main area has two sections: 'ELEVATION' and 'COORDINATES'.

ELEVATION: Ground Level (above MSL) 3225.00 ft

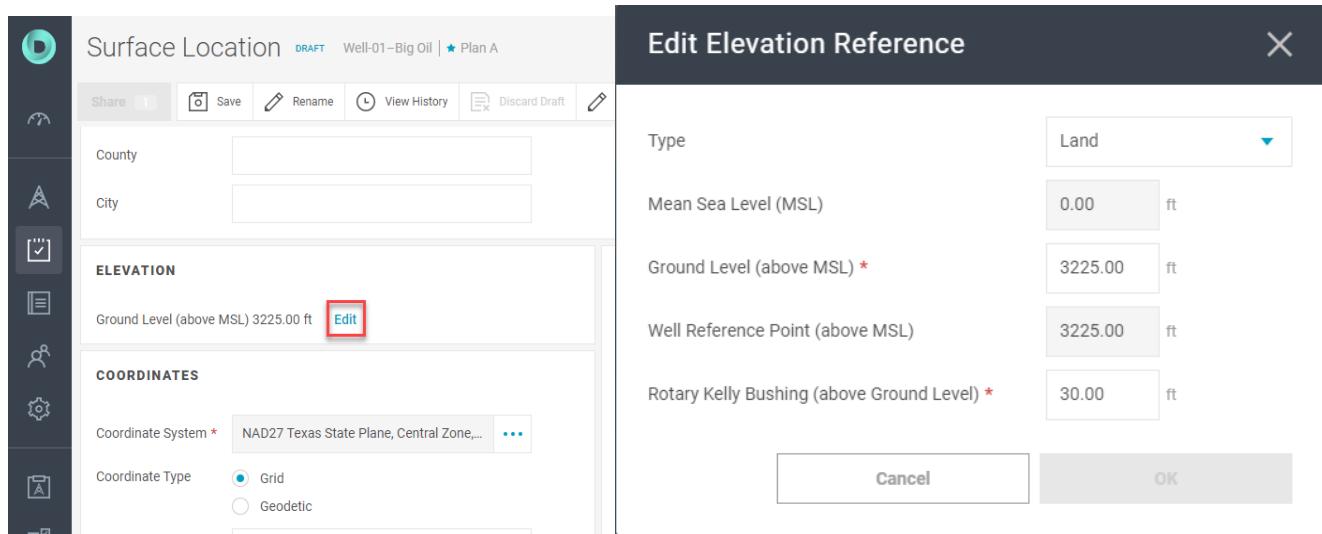
COORDINATES:

- Coordinate System: NAD27 Texas State Plane, Central Zone
- Coordinate Type: Grid (selected)
- Northing: 912081.00 ftUS
- Easting: 870696.75 ftUS
- Latitude: 32°07'24.4471"N
32.12345753 dega
- Longitude: 103°58'52.5374"W
-103.98126039 dega
- Uncertainty Radius: [empty field]
- Confidence Level: [empty field]
- Scale Factor: 1.00007333
- Grid Convergence: -1.87889700 deg

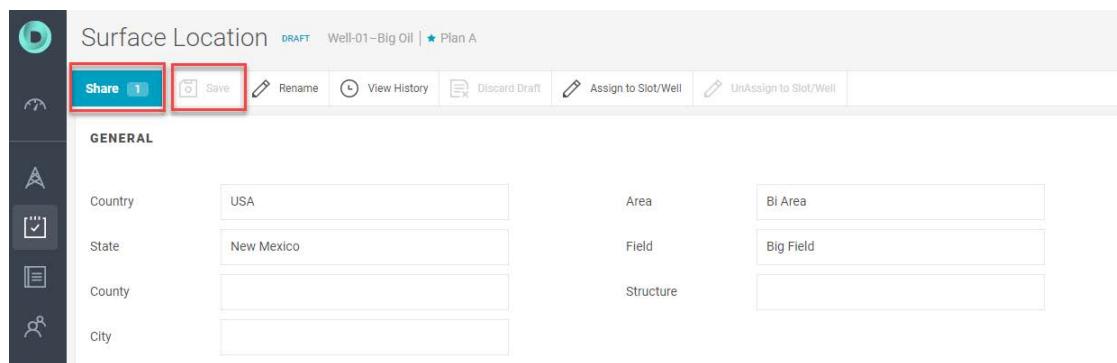
LOCATION MAP: A world map showing the location of the well in the central United States, specifically in New Mexico. A red rectangle highlights the state of New Mexico, and a blue dot marks the exact location with coordinates 912081 ftUS Northing and 870696.75 ftUS Easting.

Verify in your map if the well is correctly located in the expected area.

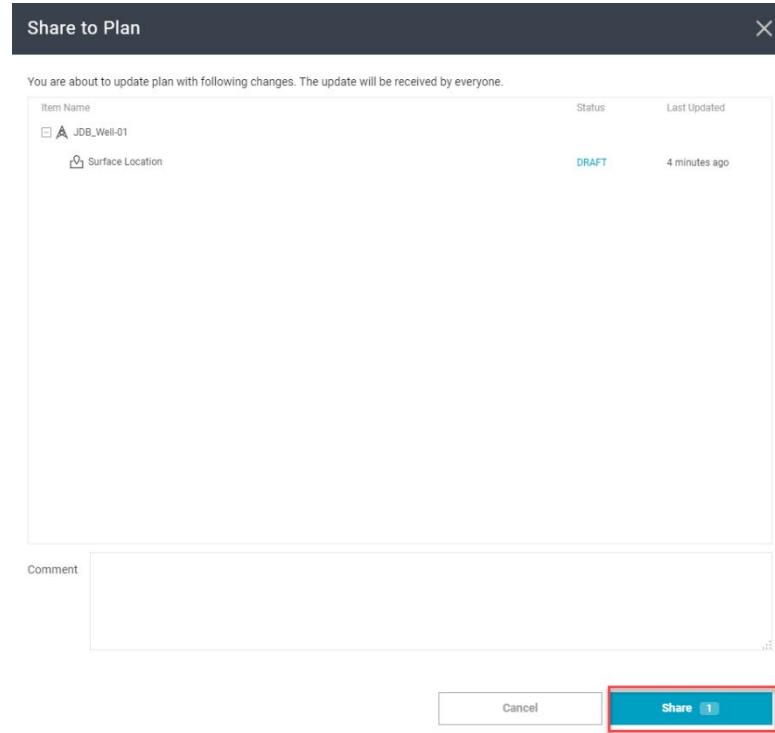
Open the Elevation sub-section by selecting Edit and adjust the Rotary Kelly Bushing (RKB) height to 30 feet above ground level. Set Ground level to 3225 ft, then select OK.



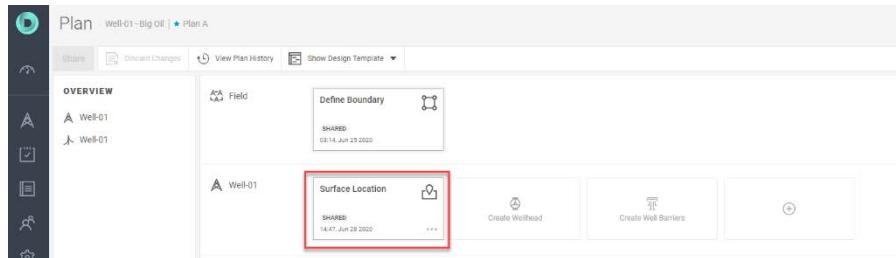
At the top of the page click on the Save  button and then click on Share  to make the Surface Location available to the rest of the team. Every time a content is shared in DrillPlan, users will be asked to enter comments (optional) in relation to the information being shared



After you click on share, you should see a popup window showing:



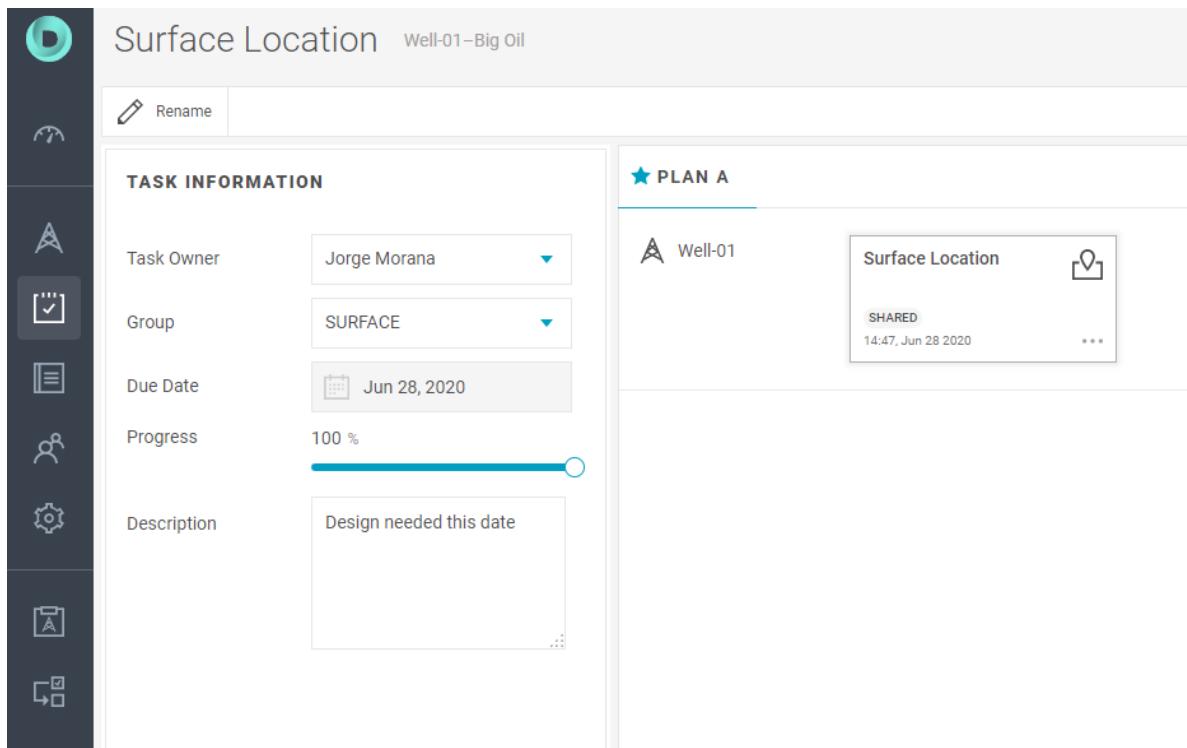
Go back to Plan view, Surface Location object is created:



To complete the surface location definition, you may want to enter the following data in the Surface Location window:

Field	Big Field
Country	USA
State	New Mexico

You may also go back to the Task view to set the progress to 100% since the task has been completed



The object will now appear to be blue color and will have a ribbon saying plan. This is particularly useful when you have multiple objects within the same task and, in some cases, several of them are shared with the team. By having this ribbon, you will know at any given time which of the objects is the one used by the solution for all engineering calculations and analyzes.

When you are still working the details of the object and haven't shared it, the color of the card will be light gray. This means that object is still a draft.

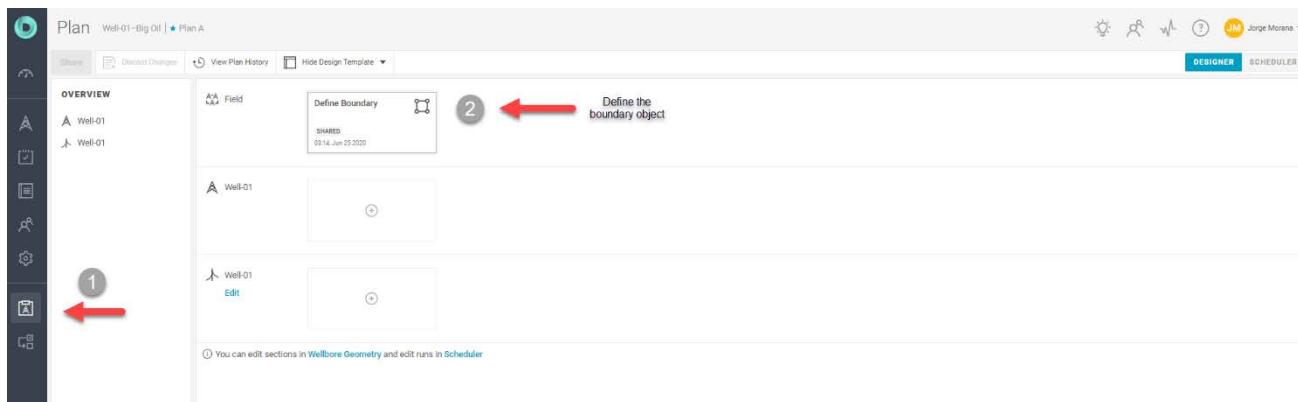
4.3 Defining a Boundary

Note: According to the latest DrillPlan release, you may experience problems in the boundary map if the surface location object (workflow) has not been created. Make sure that Surface Location workflow is saved and shared.

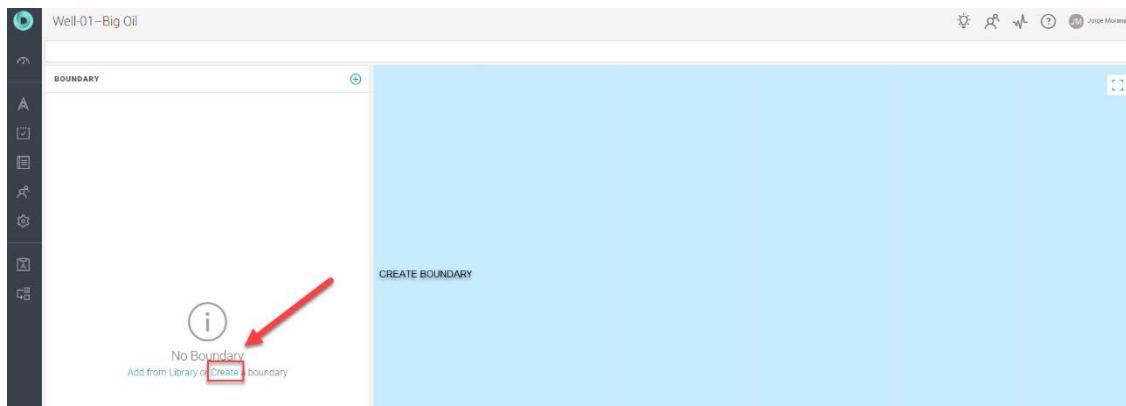
Creating the Boundary object workflow



1. Click on the Plan View Icon
2. Click on the "Define Boundary"



3. Click on the “Create” boundary button



4. In case you didn't establish a CRS yet, Select the CRS system, by using the following one: NAD27 Texas State Plane, Central Zone, US Feet. Otherwise go to the step 6.

CREATE BOUNDARY

Name *	Boundary
Type	Lease Line
Coordinate System *	...

POINTS

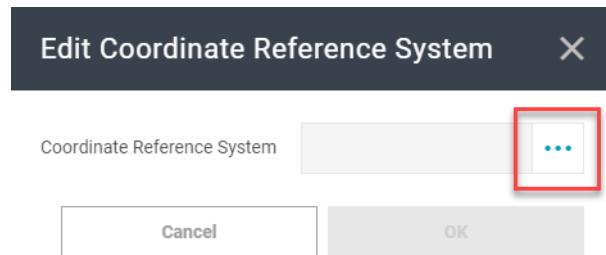
#	EASTING	NORTHING	DISTANCE (ft)	HEADING (deg)
Please click here to select the CRS				
No Point Defined				

Please select CRS to add points.

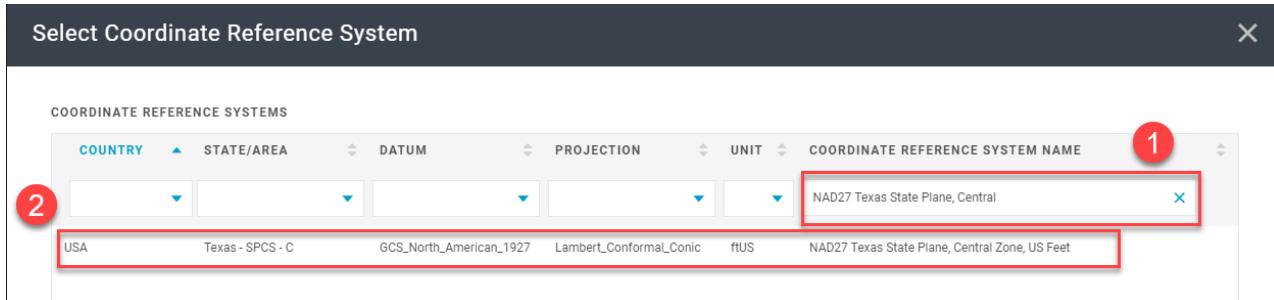
Notes

Cancel Create

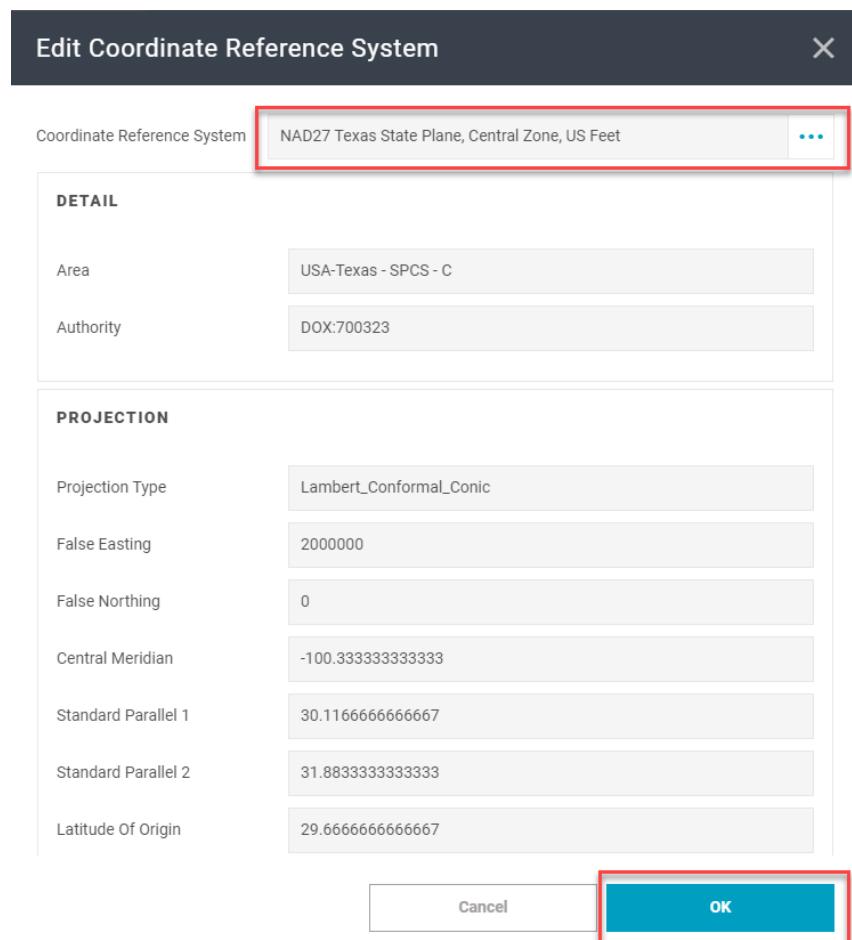
5. A popup window will show up



- i. A table with the reference systems available will appear and then, first, go the filtering box indicated, start to type the CRS needed “NAD27 Texas State Plane, Central”; second, select the filtered CRS.

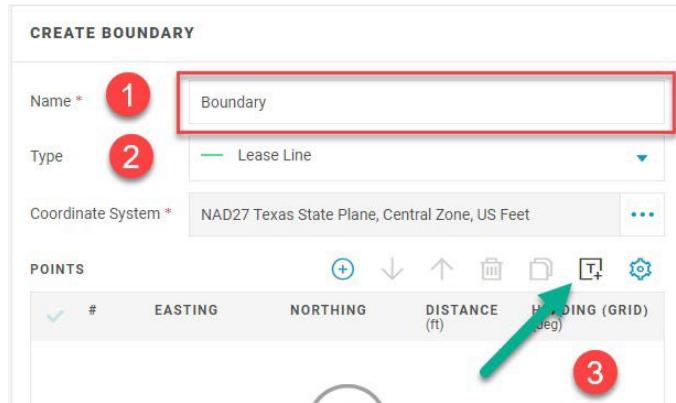


- ii. A popup windows will show up with the summary of your selection. Review that this is the right choice.



iii. Complete the information about the Boundary Name: "Boundary" (1), the Type (2):

"Lease Line" and select the  icon to copy and paste the boundaries values.



CREATE BOUNDARY

Name * **1** Boundary

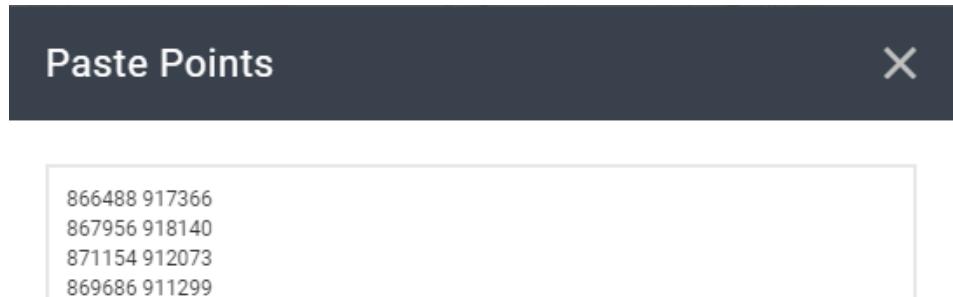
Type **2** Lease Line

Coordinate System * NAD27 Texas State Plane, Central Zone, US Feet

POINTS

#	EASTING	NORTHING	DISTANCE (ft)	HEADING (GRID) (deg)
✓				

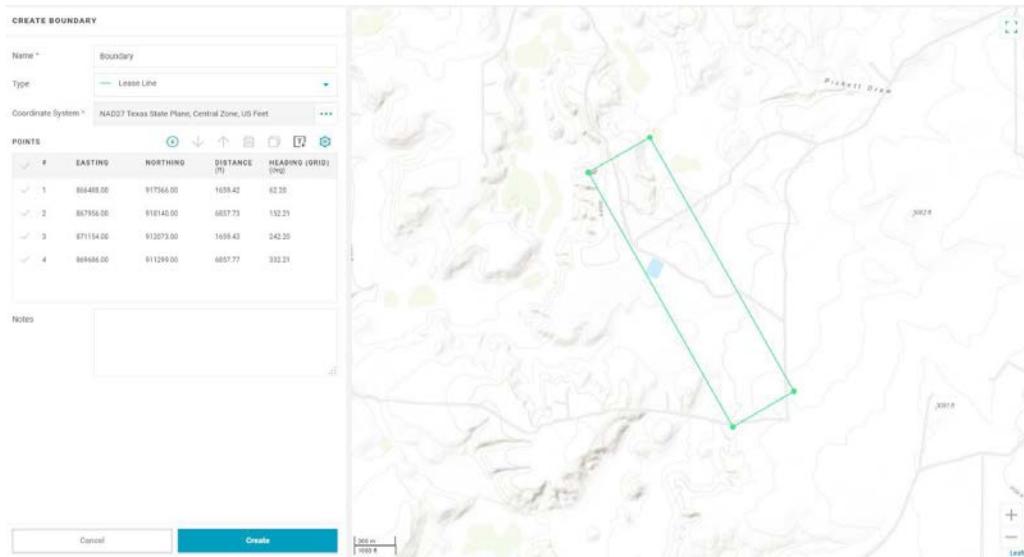
iv. Open the file Boundaries.xls from the dataset, Copy the values and paste it in the form



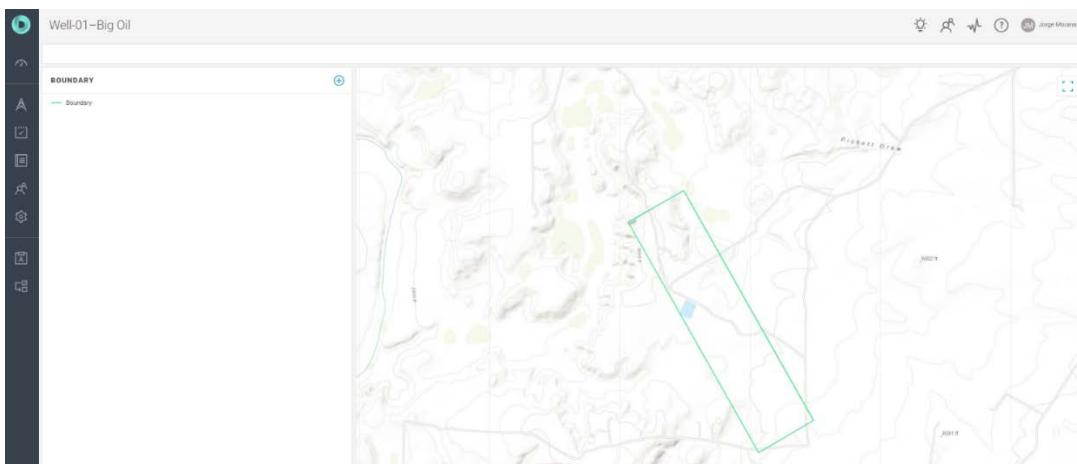
Boundary definition

X	Y
866488.34	917366.36
867956.24	918139.97
871153.76	912072.88
869685.86	911299.27

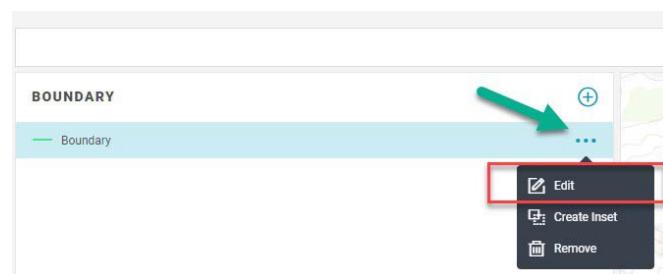
v. You should see the following results, then click on CREATE



This is the final view, once is the boundary is created.

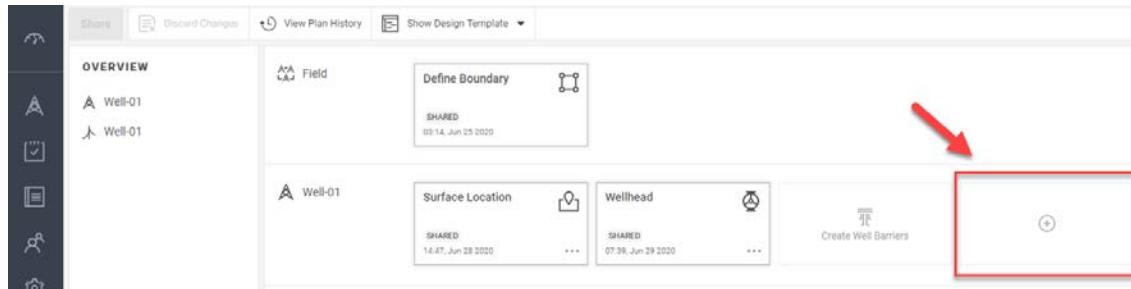


In case you want to go back and Edit the result, click on the

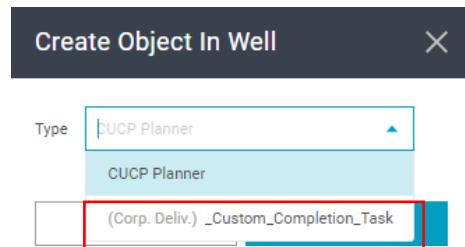


4.4 Custom Deliverables – Well Barriers

1. Go to the Plan page icon  to create a custom object
2. Go to the Surface level view and click on the plus sign icon



3. Go to the Surface level view and click on the plus sign icon



4. Go to your dataset and locate the file "WellBarrier Schematic.pdf". In the DELIVERABLE section click on the three dots icon  and pick this file.

Share  Save  View History  Rename

TYPE DEFINITION

Task type	_Custom_Completion_Task
Comment	My completion diagram to be included in the Drilling Program
Report tag	CUSTOM_COMPLETION_TASK
Template file	Completion Diagram.pdf

WORKING FILE

An optional link can be added to an external file below. Final deliverable must still be uploaded for inclusion in the report.

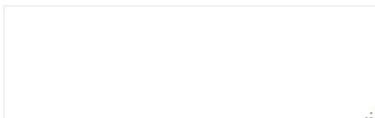
Working File  [Working File Link](#)

DELIVERABLE

File  

.doc, .docx, .pdf, .ppt, .pptx, .xls, .xlsx, .xlsm, .png and .jpg can be included directly in the report. For best results use .pdf and .pptx files.

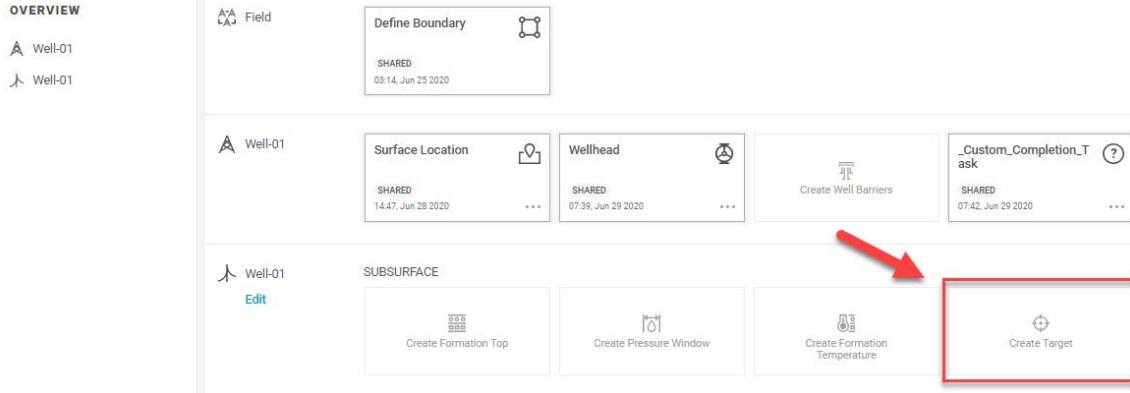
Report Insertion Insert as Figure  Insert as Document Attachment 

Other 

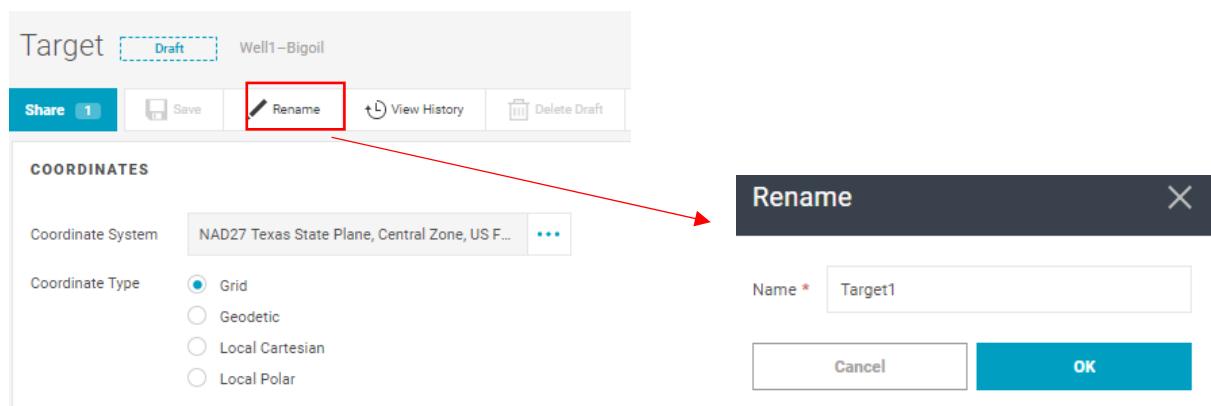
5. In the Report Insertion option, use “Insert a figure”. Click Save and Share

4.5 Targets

6. Go to the Plan page icon  to create a target object. Go to the Subsurface Tag and click on the “Create Target” object



7. You can rename this target as Target 1:

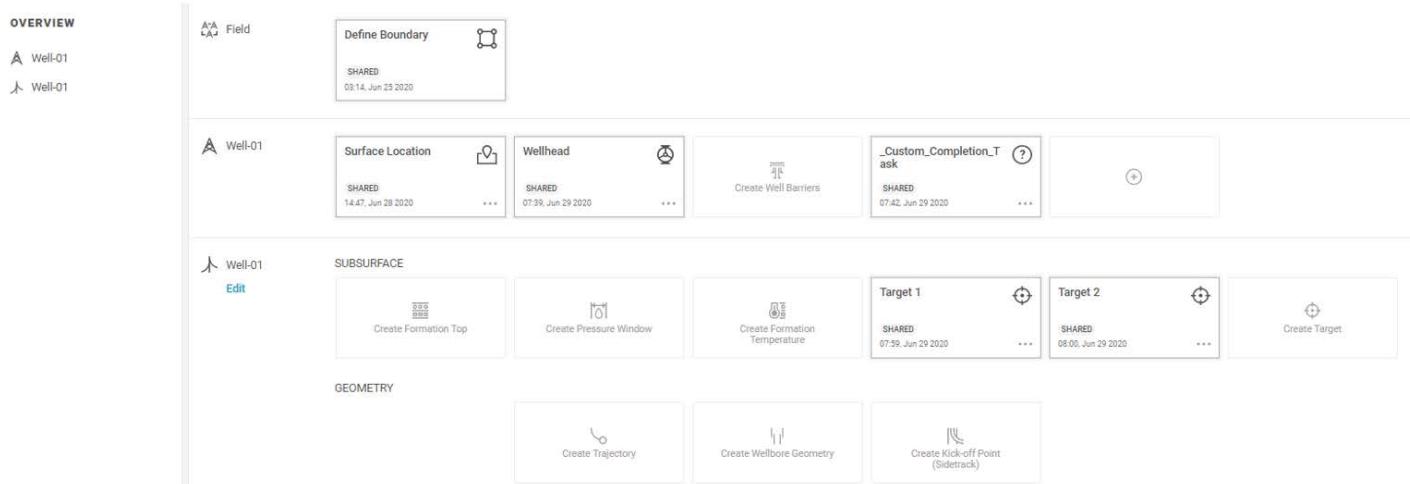


- 3 Coordinates of the targets must be entered as shown below, Repeat the same process for Second Target 2.

Description	First Target	Second Target
Northing	912834.63 ftUS	915863.1 ftUS
Easting	870321 ftUS	868809.94 ftUS
Depth Reference	MSL	MSL
TVD Depth	3672.42ft	3743.81 ft
Shape	Point	Point

- 4 Once the data is entered, save and share the changes:

5 Go back to the Plan view page, these objects created should show up in the plan view



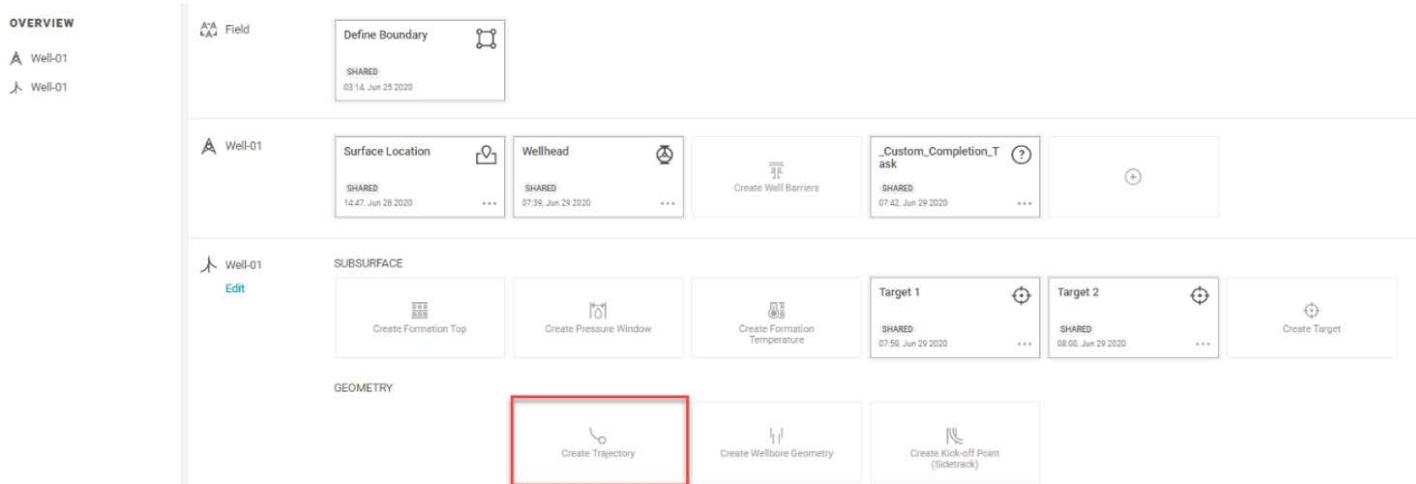
The screenshot shows the DrillPlan Plan view page with the following sections:

- OVERVIEW**: Shows a Field object named "Define Boundary" (SHARED, 03.14, Jun 23 2020).
- Well-01** section:
 - Surface Location (SHARED, 14.47, Jun 28 2020)
 - Wellhead (SHARED, 07.39, Jun 29 2020)
 - Create Well Barriers
 - _Custom_Completion_Task (SHARED, 07.42, Jun 29 2020)
 - An empty placeholder box with a plus sign (+) for creating new objects.
- Well-01 SUBSURFACE** section (Edit mode):
 - Create Formation Top
 - Create Pressure Window
 - Create Formation Temperature
 - Target 1 (SHARED, 07.59, Jun 29 2020)
 - Target 2 (SHARED, 08.00, Jun 29 2020)
 - An empty placeholder box with a plus sign (+) for creating new targets.
- GEOMETRY** section:
 - Create Trajectory (highlighted with a red box)
 - Create Wellbore Geometry
 - Create Kick-off Point (Sidetrack)

4.6 Trajectory Design

To create an automated trajectory, you need the following data (context) in DrillPlan:

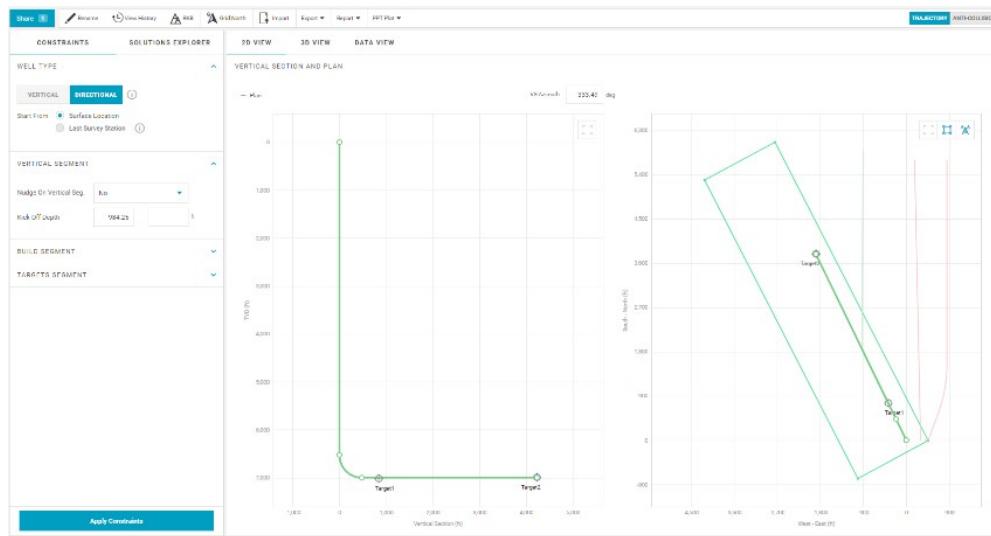
- Surface location
 - Target(s)
1. Create the Trajectory object from the page  at Wellbore level, in GEOMETRY



The screenshot shows the DrillPlan Plan view page with the following sections:

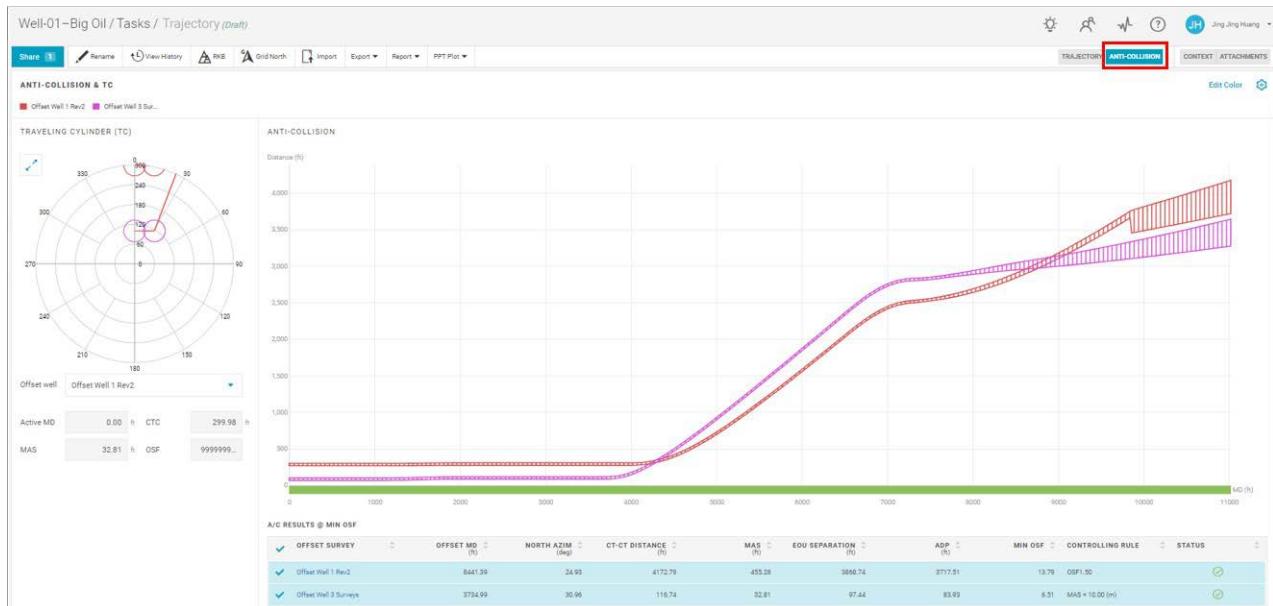
- OVERVIEW**: Shows a Field object named "Define Boundary" (SHARED, 03.14, Jun 23 2020).
- Well-01** section:
 - Surface Location (SHARED, 14.47, Jun 28 2020)
 - Wellhead (SHARED, 07.39, Jun 29 2020)
 - Create Well Barriers
 - _Custom_Completion_Task (SHARED, 07.42, Jun 29 2020)
 - An empty placeholder box with a plus sign (+) for creating new objects.
- Well-01 SUBSURFACE** section (Edit mode):
 - Create Formation Top
 - Create Pressure Window
 - Create Formation Temperature
 - Target 1 (SHARED, 07.59, Jun 29 2020)
 - Target 2 (SHARED, 08.00, Jun 29 2020)
 - An empty placeholder box with a plus sign (+) for creating new targets.
- GEOMETRY** section:
 - Create Trajectory** (highlighted with a red box)
 - Create Wellbore Geometry
 - Create Kick-off Point (Sidetrack)

2. Initial Automated Trajectory will default with 12°/100ft DLS hitting the farthest target. Additionally, Survey program default to NAL_MWD_2.0_DEG for the entire trajectory. This allow the system automatically triggers the anti-collision analysis with all the offset wells available in the master survey database

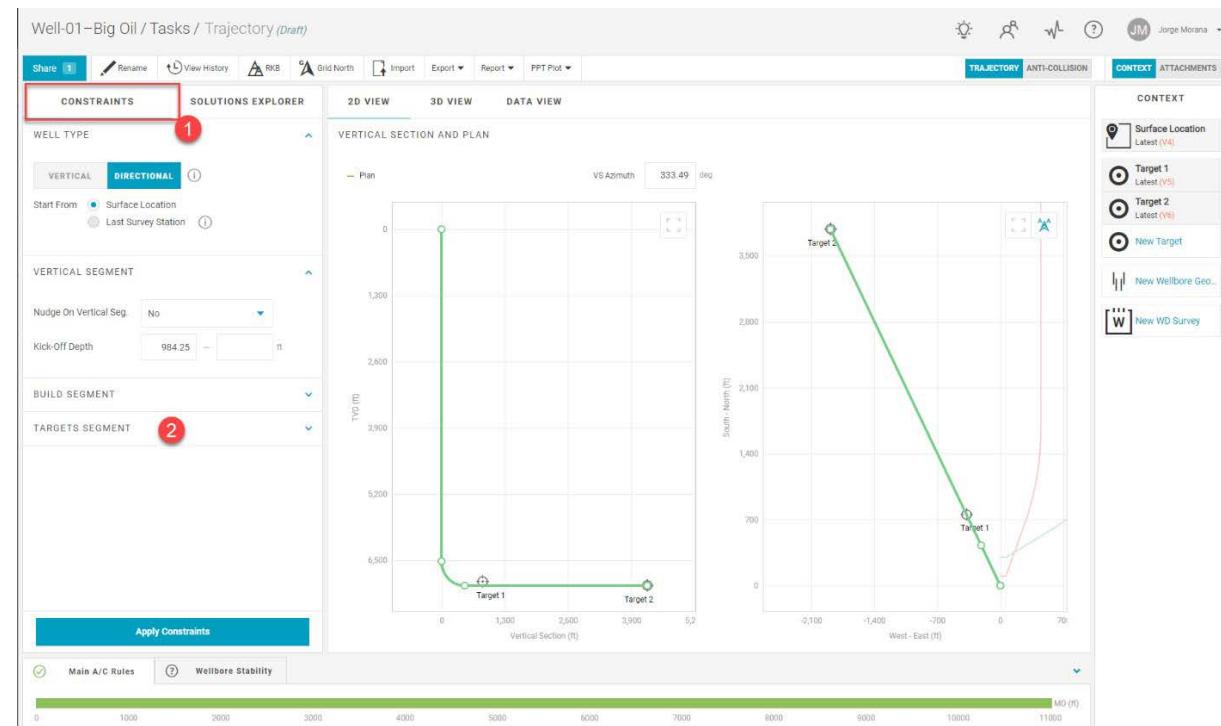




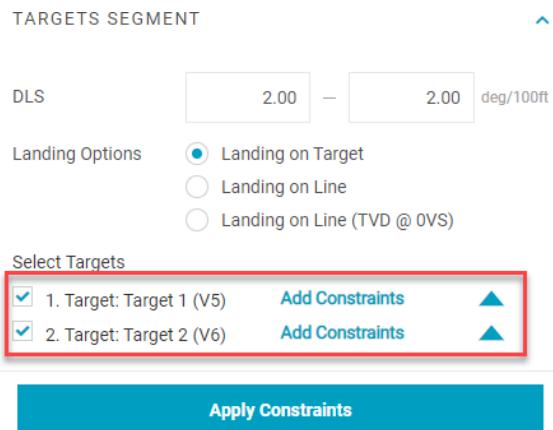
3. The Trajectory page opens. An automated trajectory is created based on the surface location, targets, and default 12°/100ft DLS. Additionally, the system automatically triggers the anti-collision analysis with all the offset wells available in the master survey database



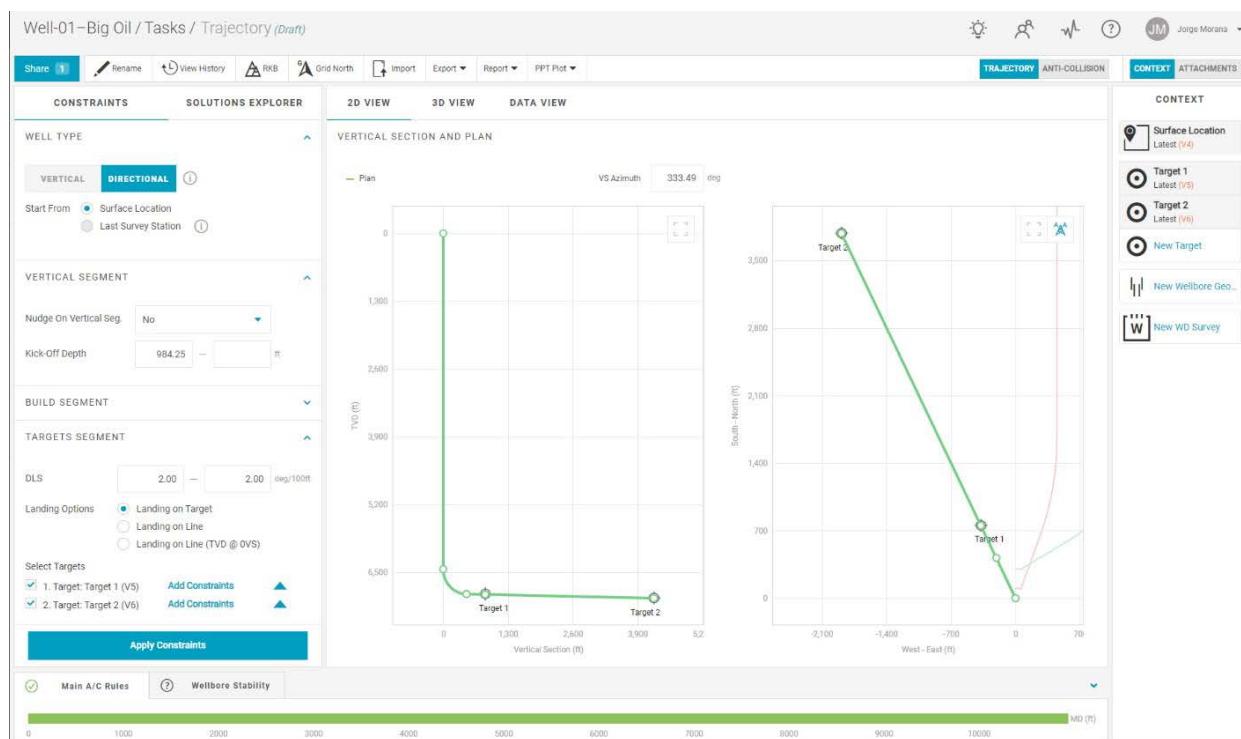
4. On the Constraints pane, the users can adjust different parameters as required for the trajectory design

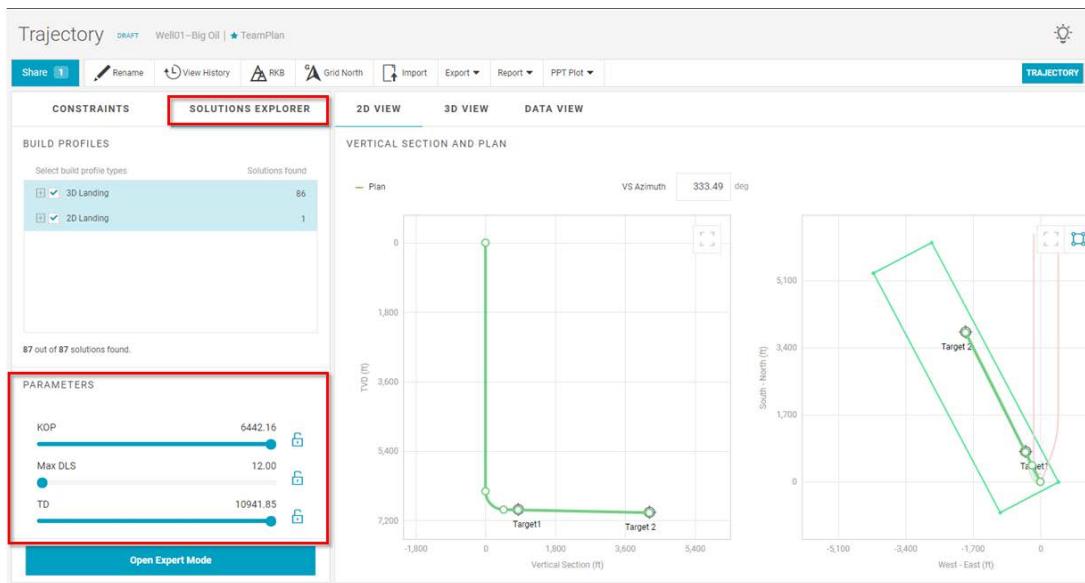


5. On the Constraints pane, click on the Targets Segment, and select the Target 1 and Target 2, then click on Apply Constraints



6. Go to solution Explorer to toggle through the parameters to find the most plausible solution.





7. Click on Share and then Compete if it is necessary

4.7 Formation Tops

4.7.1 Defining Formations Names in the Corporate Setting

It is highly advised that before the formation top object is created, the Corporate Setting user assigned for this role defines the formations name.

Go to Corporate Setting

Open the Formation Catalog

Corporate Settings

✓ Expand All ⚪ Collapse All

DELIVERABLES AND TASKS

CASING DESIGN RULESETS

KICK TOLERANCE CRITERIA

TORQUE & DRAG CRITERIA

PROJECT TASK TEMPLATES

REPORT TEMPLATES

PRICE BOOK

FORMATION CATALOG

FORMATION NAME

Atoka			
Bell Canyon			
Brushy Canyon			
Cherry Canyon			
First Bone Spring			

1. Click on the plus sign and include the Formation Name

FORMATION CATALOG

FORMATION NAME

WolfCamp A			
WolfCamp B			
WolfCamp C			
WolfCamp D			

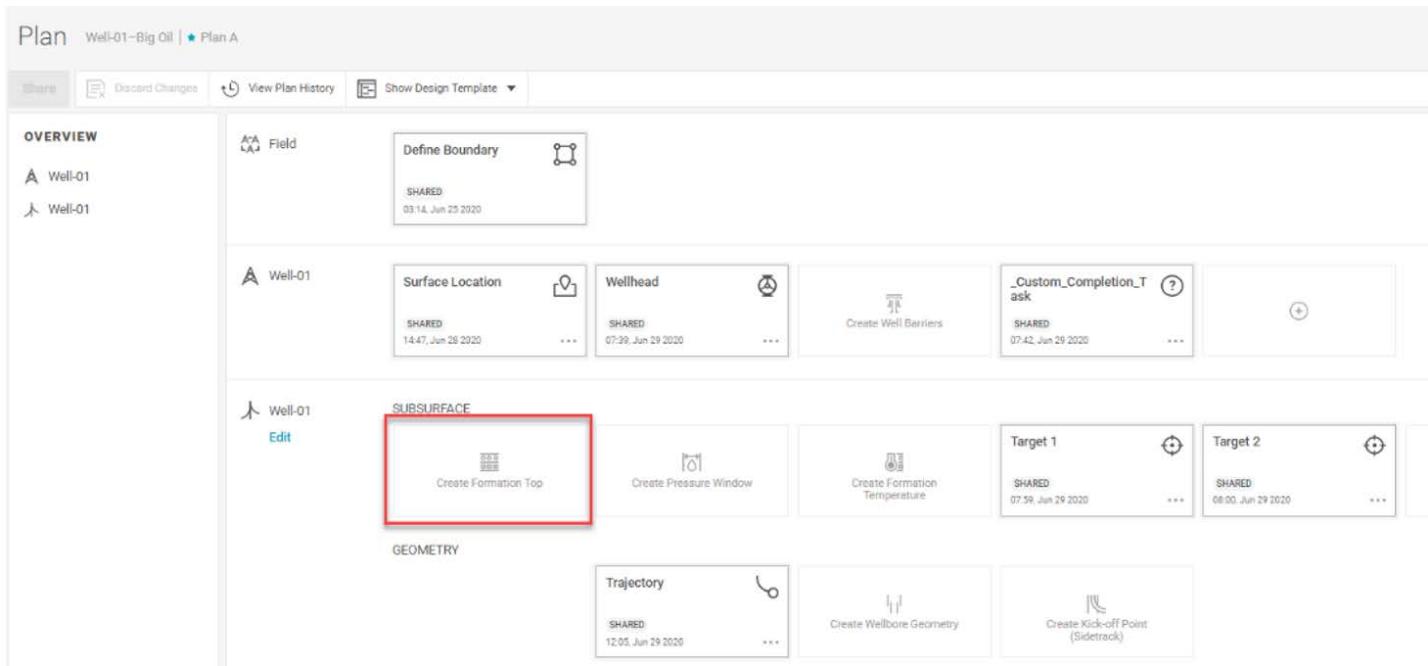
Add a row above

Add a row below

4.7.2 Creating the Formation Top Object

Let's create the Formation Tops object

1. Go to the Plan page icon  and create object in Wellbore as show



The screenshot shows the DrillPlan Plan page interface. At the top, there are navigation tabs: 'Plan' (selected), 'Well-01-Big Oil', and 'Plan A'. Below the tabs are buttons for 'Share', 'Discard Changes', 'View Plan History', and 'Show Design Template'. The main area is divided into sections: 'OVERVIEW', 'SURFACE', 'SUBSURFACE', and 'GEOMETRY'. In the 'SURFACE' section, there are cards for 'Surface Location' (Shared, 14:47, Jun 28 2020) and 'Wellhead' (Shared, 07:39, Jun 29 2020). In the 'SUBSURFACE' section, there are cards for 'Create Well Barriers' (ask, Shared, 07:42, Jun 29 2020), 'Custom_Completion_T' (ask, Shared, 07:42, Jun 29 2020), 'Target 1' (Shared, 07:59, Jun 29 2020), and 'Target 2' (Shared, 08:00, Jun 29 2020). The 'Create Formation Top' button is highlighted with a red box. In the 'GEOMETRY' section, there are cards for 'Trajectory' (Shared, 12:05, Jun 29 2020), 'Create Wellbore Geometry', and 'Create Kick-off Point (Sidetrack)'.

2. Click on the “Create Formation Top” object at the Wellbore level
3. In the Formation Top table, select  Add new row to add an empty row for formation top data
4. In the table row, double-click each cell, and then enter the required data:
 - TVD RT: The TVD of the formation top from the rotary table
 - Depth Uncertainty Up: The depth uncertainty up of the formation top
 - Depth Uncertainty Down: The depth uncertainty down of the formation top
 - Formation Tops: The name of the formation top
 - Rock Type: The rock type of the formation
 - Hydrocarbon Bearing



TVD RT (ft)	Depth Uncertainty Up	Depth Uncertainty Down	Formation Tops	Rock Type	Hydrocarbon Bearing
800			Bell Canyon	Shale	FALSE
1100			Cherry Canyon	Shale	FALSE
1500			Brushy Canyon	Shale	FALSE
2000			First Bone Spring	Shale	FALSE
2500			Second Bone Spring	Shale	FALSE
3200			Third Bone Spring	Shale	FALSE
3800			WolfCamp A	Other	FALSE
4600			WolfCamp B	Other	FALSE
5200			WolfCamp C	Other	FALSE
5900			WolfCamp D	Other	FALSE
6881			Strawn	Other	FALSE
6927			Atoka	Other	FALSE

5. Optional: Manage the rows of data:

- To delete a row, select the row and select Delete
- To move a row up or down, select Move up or Move down

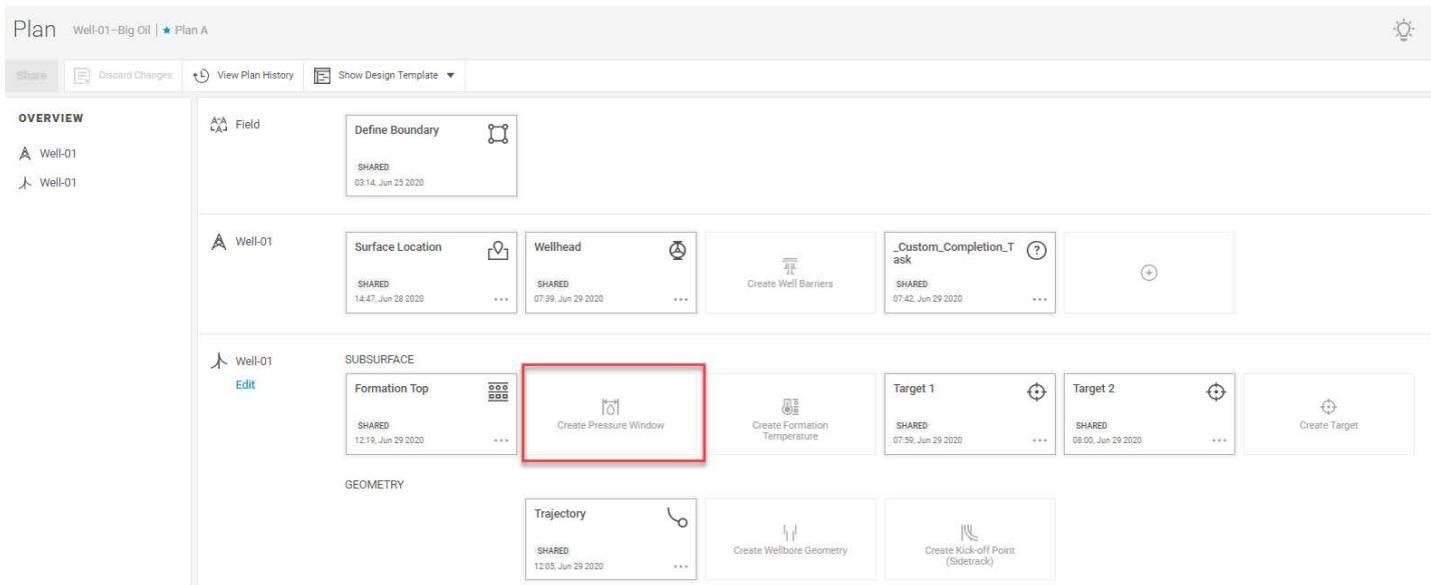
6. Select Save to save the data, and then select Share to share the data object
You should see this now:

TOP TVD-RKB (ft)	DEPTH UNCERTAINTY UP (ft)	DEPTH UNCERTAINTY DOWN (ft)	FORMATION	ROCK TYPE	HYDROCARBON BEARING
800.00			Bell Canyon	Shale	<input type="checkbox"/>
1100.00			Cherry Canyon	Shale	<input type="checkbox"/>
1500.00			Brushy Canyon	Shale	<input type="checkbox"/>
2000.00			First Bone Spring	Shale	<input type="checkbox"/>
2500.00			Second Bone Spring	Shale	<input type="checkbox"/>
3200.00			Third Bone Spring	Other	<input type="checkbox"/>
3800.00			WolfCamp A	Other	<input type="checkbox"/>
4600.00			WolfCamp B	Other	<input type="checkbox"/>
5200.00			WolfCamp C	Other	<input type="checkbox"/>
5900.00			WolfCamp D	Other	<input type="checkbox"/>

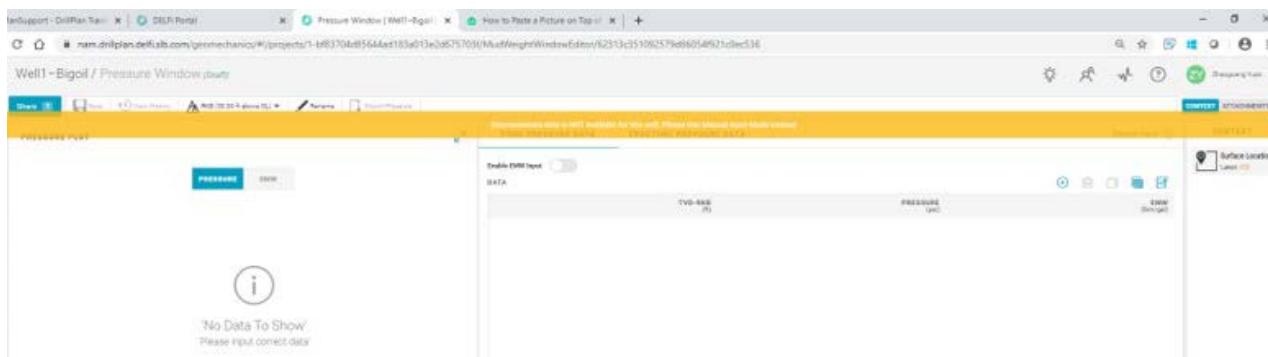
You can go back to Task View and set the progress bar to 100%.

4.8 Pressure Window, also known as Mud Weight Window (Manual Input)

1. Go to the Plan  page icon
2. Click on the “Create Pressure Window” Object, at the Wellbore level, Subsurface tag.



You will see this:



A message bar will come up to advise you that “No Geomechanics Service is available at present...”. This means the mud weight window object is not linked to a geomechanics analysis yet and entry data must be done manually or, that “Successfully loaded pressure data from Geomechanics Insights” which means that your mud window is linked to a 1D MEM (more on this in the section 4.17).

Make sure the Elevation reference is correctly set. For our case it is set to RKB



The screenshot shows the DrillPlan Pressure Window interface. At the top, it says "Pressure Window" and "DRAFT Well-01-Big Oil | ★ Plan A". Below the title are several buttons: "Share 1", "Save", "View History", "Elevation Reference (RKB 30.00 ft above GL)", "Rename", and "Export Pressure". The "Elevation Reference" button is highlighted with a red box.

3. Select the import button (top right corner) and browse to import the file Demo - Pore Pressure.csv. After importing the data, you should see this:



The screenshot shows the "PORE PRESSURE DATA" tab. It has a "DATA" section with a table. The table has columns: TVD-RKB (ft), PRESSURE (psi), and EMW (lbm/gal). The data rows are:

TVD-RKB (ft)	PRESSURE (psi)	EMW (lbm/gal)
30.00	13.00	8.34
2000.00	900.00	8.66
3949.75	2000.00	9.75
5600.00	3000.00	10.31
7000.00	4125.00	11.34

4. Switch to the Fracture Pressure data tab and repeat the process to import the Fracture Pressure curve.

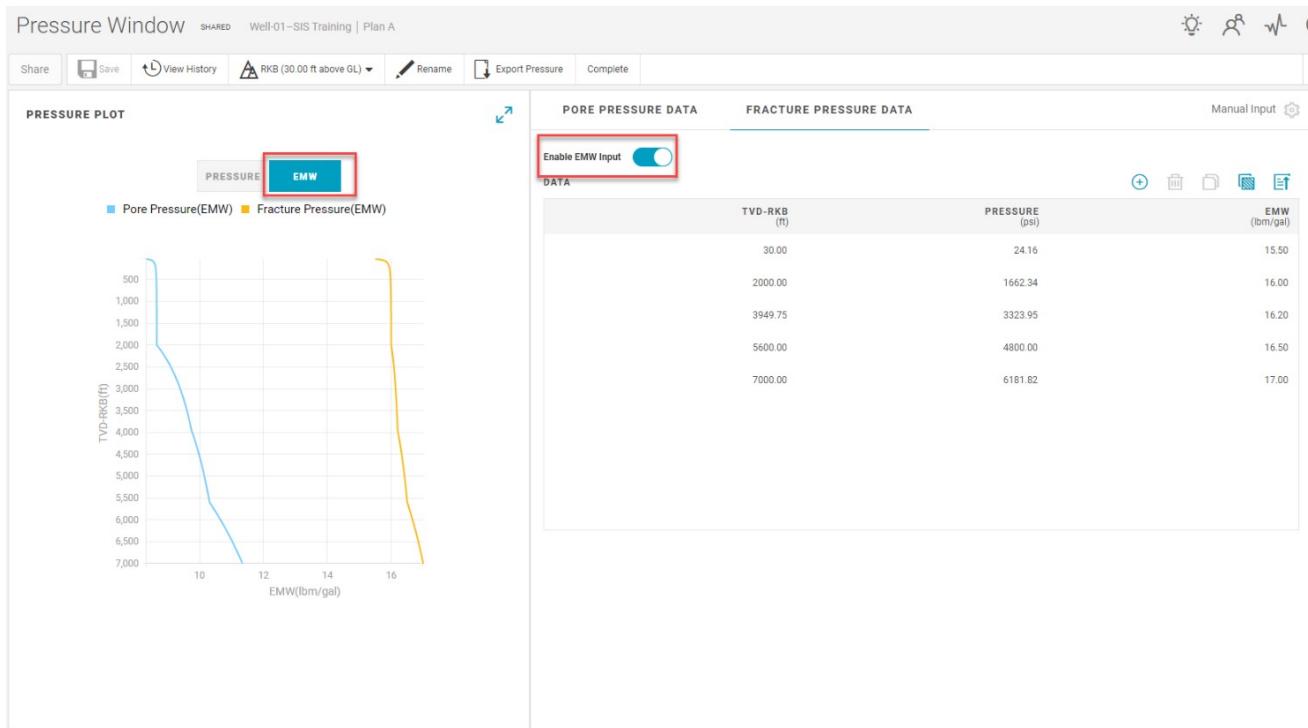


The screenshot shows the "FRACTURE PRESSURE DATA" tab. It has a "DATA" section with a table. The table has columns: TVD-RKB (ft), PRESSURE (psi), and EMW (lbm/gal). The data rows are:

TVD-RKB (ft)	PRESSURE (psi)	EMW (lbm/gal)
30.00	24.16	15.50
2000.00	1662.34	16.00
3949.75	3323.95	16.20
5600.00	4800.00	16.50
7000.00	6181.82	17.00

5. When done remember to save, share, complete and set the progress bar accordingly.

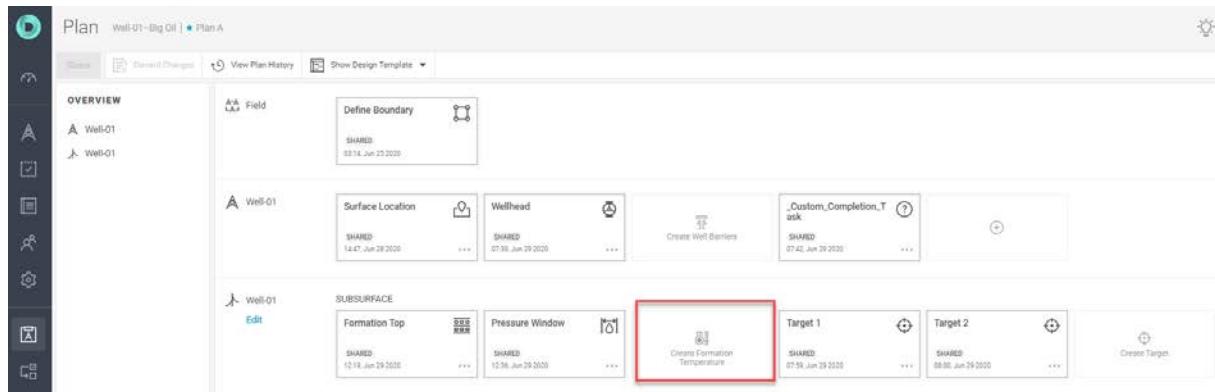
A new button has been included : **Enable EMW Input**, to be able to manually enter the EMW for Pore Pressure and for Fracture pressure. The Pressure plot can also be viewed as EMW Plot.

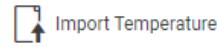


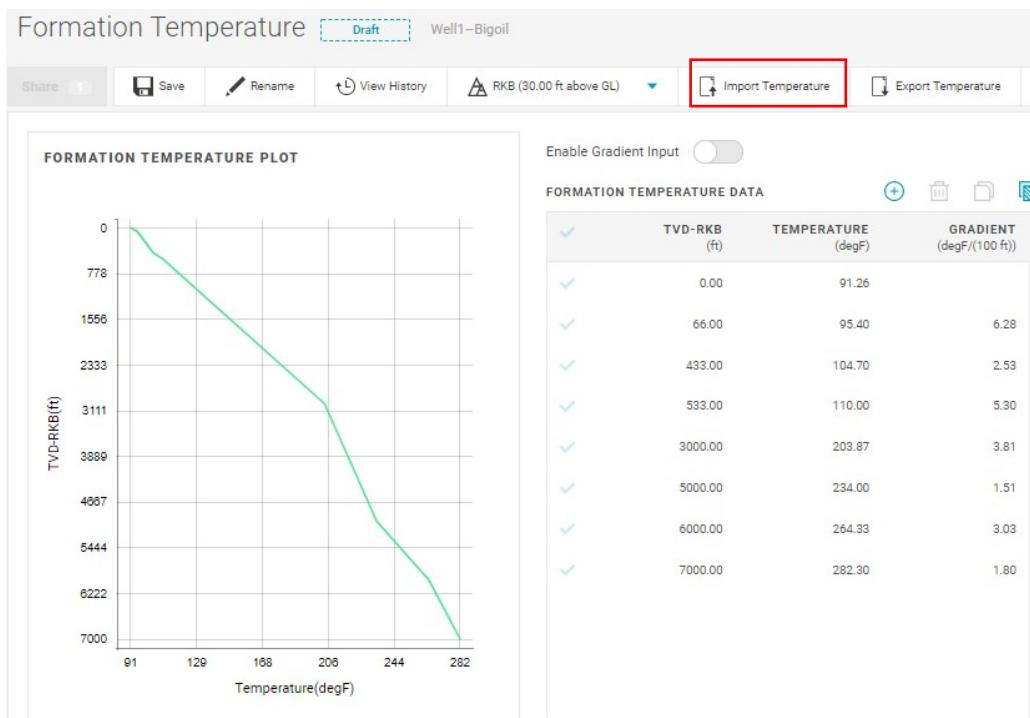
As part of the collaborative environment, a more advanced workflow where describing the integration between Geomechanics Services and DrillPlan will be demonstrated later on during this training (section 4.17).

4.9 Formation Temperature

6. Go to the Plan page icon  Click on the “Create Formation Temperature” object the Wellbore level, using subsurface tag



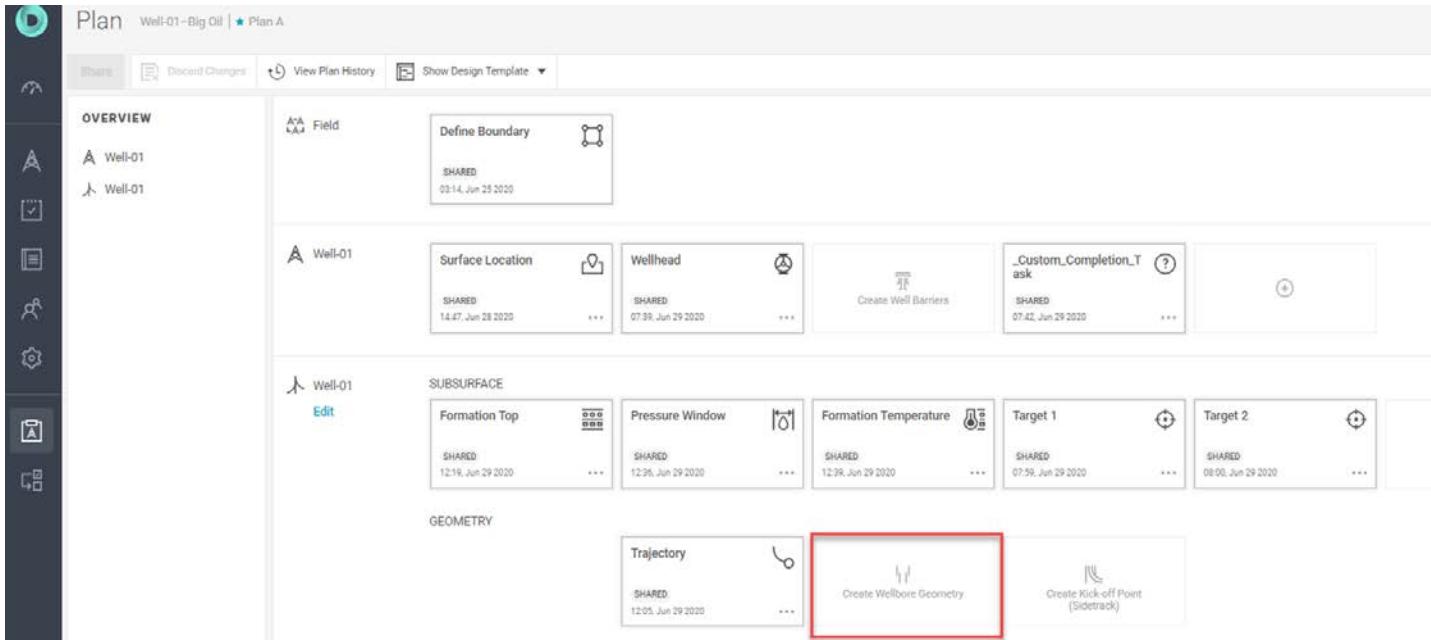
7. Now, choose to import the demo temperature.csv file by clicking the Import Temperature button, , and choosing the temperature file provided. Then, your formation temperature should look like the below snapshot:



8. When done remember to save, share, complete and set the progress bar accordingly.

4.10 Wellbore Geometry

1. Go to the Plan page icon  to create the Wellbore Geometry Object. Go to the wellbore level view and click on “Create Wellbore Geometry” Object, on the Geometry tag



Here you have 3 main tabs, Section, Casing Definition and Validation. In the Section Tab click on the plus icon.

4.10.1 Sections Definition

Based on the WELLBORE GEOMETRY TABLE, we now can define the sections sizes.

2. Click on the plus sign icon  , located in the section tab table, as follow:

Well1-Bigoil / Wellbore Geometry					
		SECTION		CASING DEFINITION	
<input type="checkbox"/> Lock the last section to the end of trajectory					
SECTION SI... (in)	LOCK TO (MD/TVD)	END DEPTH ... (ft)	END DEPTH ... (ft)	DESCRIPTION	

3. Include the 3 sections as per the following Wellbore Geometry table specifications, by typing the Section size and End Depth.
4. Make your that the last section of the table is locked to the trajectory that was created in the exercise 4.11, as following

Your section should look like the below image. Note: the end MD for the 8.5 in section will be updated with your trajectory's final MD.

SECTION		CASING DEFINITION		
<input checked="" type="checkbox"/> Lock the last section to the end of trajectory (10941.85 ft MD)				
SECTION SIZE (in)	LOCK TO (MD/TVD/FM TOP)	END MD (ft)	END TVD (ft)	DESCRIPTION
17.5	MD	900.00	900.00	SURFACE
12.25	MD	3500.00	3500.00	INTERMEDIATE
8.5	MD	10941.85	6998.81	PRODUCTION

4.10.2 Casings Definition

Based on the previous Wellbore geometry table,

1. Click on the **Casing Definition Tab**. The first row is automatically highlighted, then go to the **SPECIFICATION** and type the **Start Depth of 0 ft** for the **17.5" section**. **Type of "Casing"**. Then

Click on the 3 dots to open the Tubular Catalog

SECTION		CASING DEFINITION			WELLHEAD DEFINITION				VALIDATION		
SECTION ... (in)	TYPE	TUBULAR	OD (in)	ID (in)	DRIFT ID (in)	START MD (ft)	END MD (ft)	TOC (ft)	GRADE	CONNEC... L80	
17.5	Casing	▼ 13.625" Casing 88.2 lbm/ft L80	13.625	12.375	12.250	0.00	900.00	0.00	L80	MTC	
12.25	Casing	▼ 9.625" Casing 43.5 lbm/ft C90	9.625	8.755	8.599	0.00	3500.00	0.00	C90	MTC	
8.5	Production Casing	▼ 7" Casing 26 lbm/ft J55 LTC	7.000	6.276	6.151	0.00	11020.20	4000.00	J55	LTC	

Then a popup window should show up, as following, by selecting the casing according on the specification of the wellbore geometry table:

Select Component

OD	13.625	in
ID	All	12.375 in
Linear Weight	All	88.200 lbm/ft
Grade	All	L80 C90 O95 T95
	P110 Q125 U140	

Component

Description	OD in	ID in	Linear Weight lbm/ft	Grade	Top Connecti...	Source	
13.625" ...	13.625	12.375	88.20	L80	IFJ	Default	▲
13.625" ...	13.625	12.375	88.20	L80	BTCHM	Default	
13.625" ...	13.625	12.375	88.20	L80	SLH	Default	
13.625" ...	13.625	12.375	88.20	L80	BTC	Default	
13.625" ...	13.625	12.375	88.20	L80	BTM	Default	
13.625" ...	13.625	12.375	88.20	L80	MTC	Default	

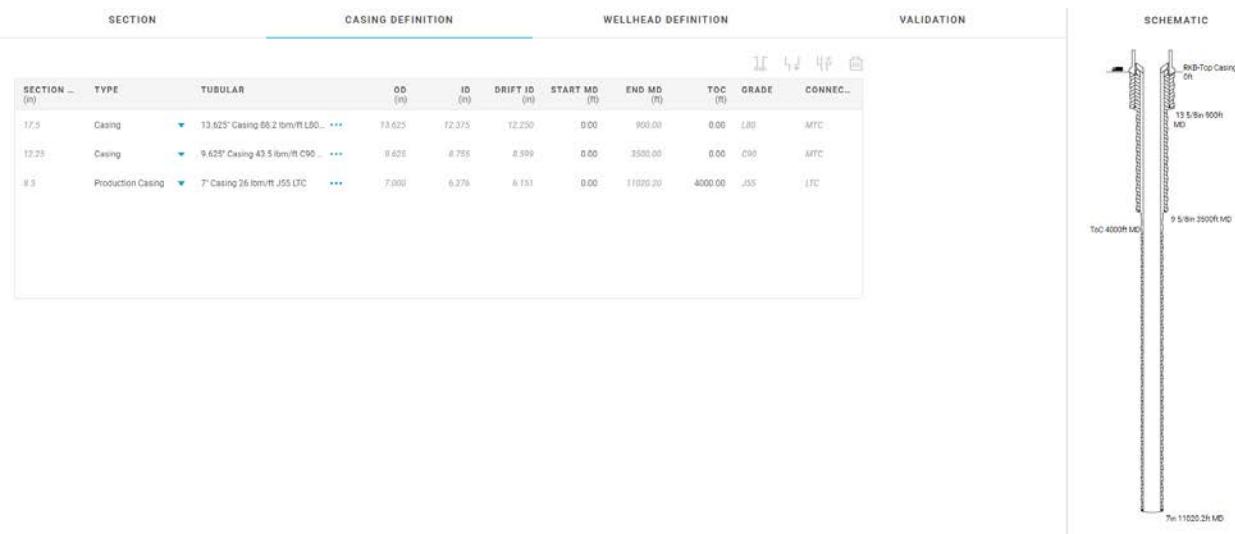
OK Cancel

WELLBORE GEOMETRY TABLE

Section	Type	Tubular	OD (in)	ID (in)	End Depth MD (ft)	TOC (ft)	Grade	Top Connection
17.5"	Casing	13.625" Casing 88.2 lbm/ft	13.625	12.375	900	0	L80	MTC
12.25"	Casing	9.625" Casing 43.5 lbm/ft	9.625	8.755	3500	0	C90	MTC
8.5"	Production Casing	7" Casing 26 lbm/ft	7	6.276	Lock to end	4000	J55	LTC

- Enter the info for the 12.25" section and 8.5" section.

At the end you should have the wellbore schematic completed, as follow:



4.10.3 Wellhead

1. Click on “WELLHEAD DEFINITION tab”
 2. In the editor window, select:
 - Wellhead type: Unihead
- Your object should look like this:

SECTION		CASING DEFINITION			WELLHEAD DEFINITION	
Type	<input checked="" type="radio"/> Unihead <input type="radio"/> Spool <input type="radio"/> Other/Not specified(activities have to be manually added)					
Description	10 ksi					

When you have shared, you may see in the top bar a Complete option to appear. This is the one to select in order to trigger the Review & Approve process for the object. After you select Complete, you will see the object card to change to green color which means this is now in the review & approve process.



Once done, remember to set progress accordingly.

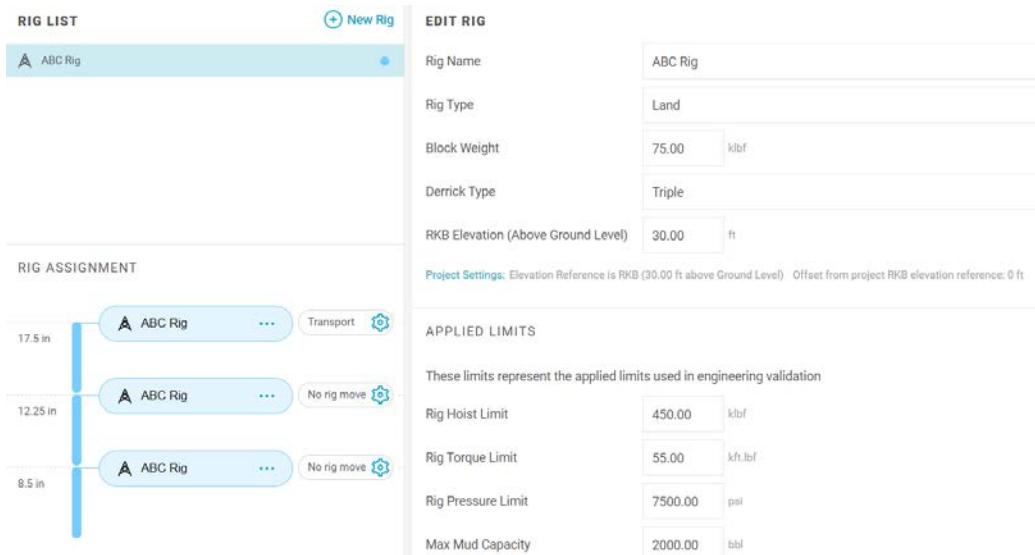
4.11 Rig Configuration

1. Go to the Plan page icon  and create the Rigs object in Well level:
2. Locate the “Geometry” tag and Click on the “Create Rigs” object at the Wellbore level



3. Name the rig “Rig ABC” and enter the following data:

Rig Name:	ABC
Rig type:	Land
Block weight:	75 klbf
Derrick Type	Triple
RKB Elevation	30 ft
Rig Hoist Limit:	450 klbf
Rig Torque Limit:	55 kft.lbf
Rig Pressure Limit:	7500 psi
Max. Mud Capacity:	2 000 bbl



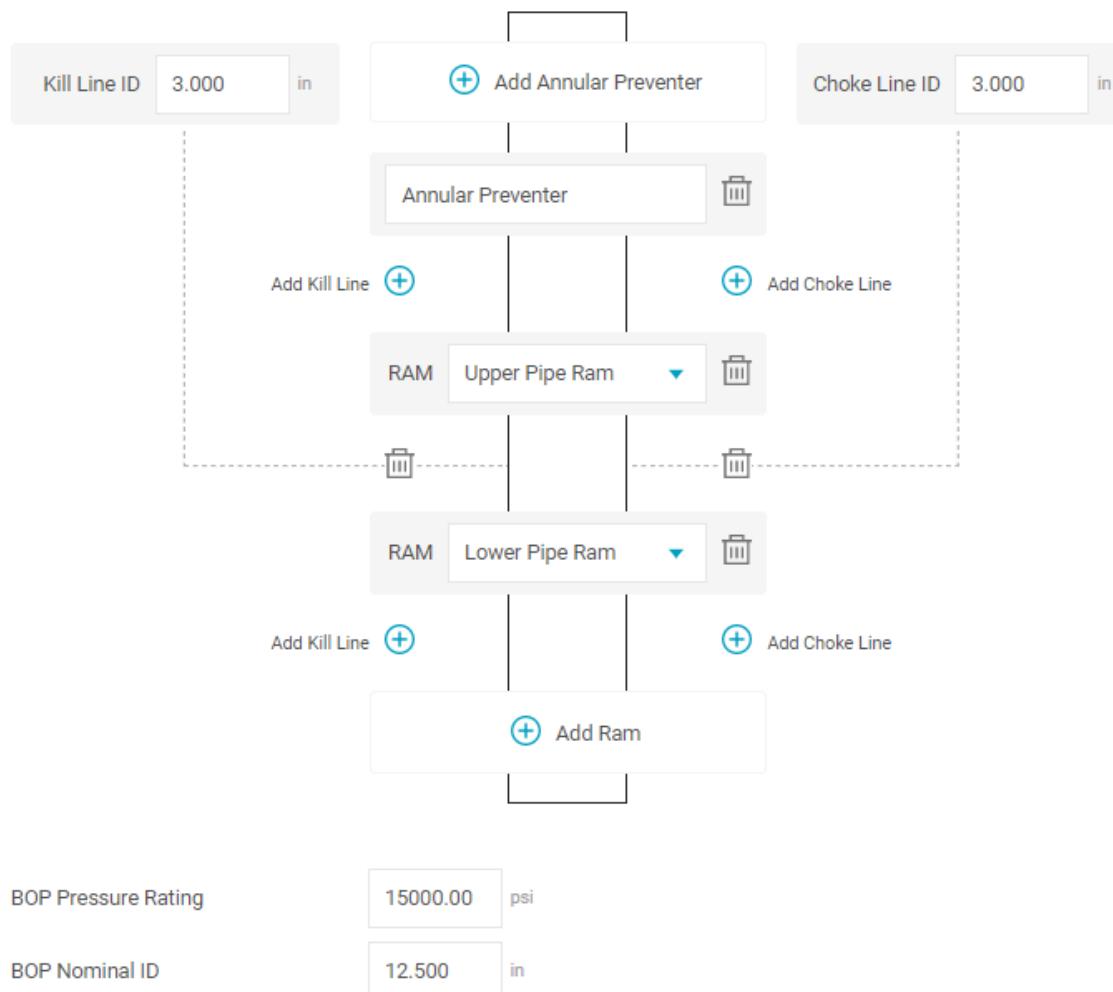
On the left bottom side, you have the option to select multiple rigs for the same well, as example: Rig ABC for drilling and Rig XYZ for completions.

BOP Definitions:

Enter BOP information as following,

BOP DEFINITION

BOP definition required to define well barriers and perform engineering validation.

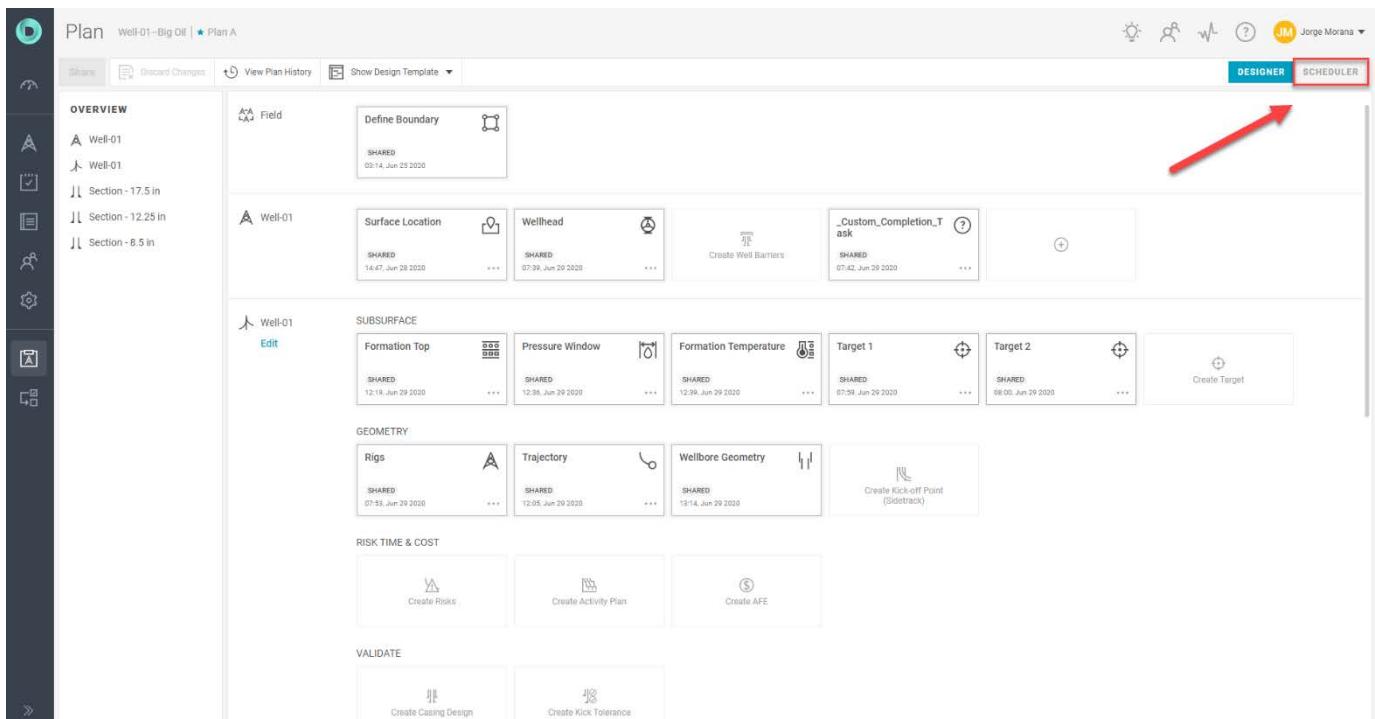


Click Save and Share

Go back and set the progress bar to 100%.

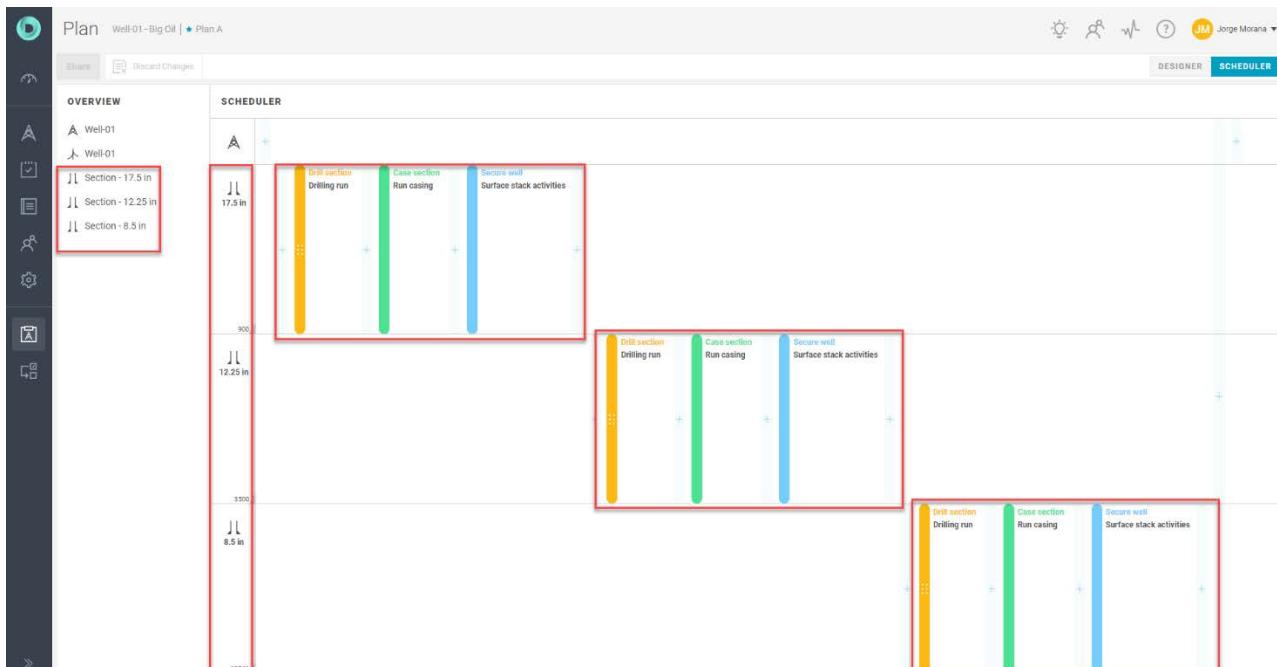
4.12 Scheduler

Once the Wellbore Geometry object is created, you can go to the Scheduler Tab located in the Plan view as Shown:



A screenshot of the DrillPlan software interface in the 'DESIGNER' tab. The left sidebar shows a tree view of sections: Well-01, Well-01, Section - 17.5 in, Section - 12.25 in, and Section - 8.5 in. The main area is titled 'OVERVIEW' and contains cards for 'Field', 'Well-01', 'SUBSURFACE', 'GEOMETRY', 'RISK TIME & COST', and 'VALIDATE'. A red arrow points from the text below to the 'SCHEDULER' tab at the top right.

Click on the Scheduler Tab. Automatically, the main activities to be performed at surface and in the sections will appear as shown:



A screenshot of the DrillPlan software interface in the 'SCHEDULER' tab. The left sidebar shows a tree view of sections: Well-01, Well-01, Section - 17.5 in, Section - 12.25 in, and Section - 8.5 in. The main area displays a timeline for three well sections. Each section is represented by a vertical bar divided into three colored segments: yellow for 'Drill section' (Drilling run), green for 'Casing section' (Run casing), and blue for 'Secure well' (Surface stack activities). The sections are labeled with their respective diameters: 17.5 in, 12.25 in, and 8.5 in. Red boxes highlight the activity segments for each section.

In the Scheduler view of the Activity Plan page, you can see a visual representation of the activity plan.

Each bar represents a key activity, such as drilling, casing, cementing, and surface stack activities, for each section.

The Scheduler is based on the wellbore geometry data, the runs on the Tasks page, and the predefined activity template.

There are two types of Scheduler view:

- Drilling
- Completion

In the Drilling view, the depth range of an activity bar matches either the depth range of the section, or the depth range of the activity.

You can add other activity runs to the Scheduler, and any related activities are added to the Activities list in the Activity view.

To edit the activity depth of a manually added activity, click the icon in the middle of the bar, and under Edit run enter a new Run End Depth.

4.13.1 Scheduler activities

You can add activities to a section in the **Scheduler** view.

The activities that you can add to open holes include:

- Clean out run
- Drill stem test
- Wireline
- Slickline
- Recover mechanical plug

For a full list of activities go to the Appendix 7.7 Scheduler Activities List

4.13.2 Add an activity to the Scheduler

You can add activities to a section in the Scheduler view.

- In the Scheduler view, point to where you want to add an activity until image appears, and then click.

Note: If you cannot add an activity at a position, image does not appear.

- In the Add Activity callout, select the activity run that you want to add.
The activity is added and the related activities are added to the activity list in the Activity pane.

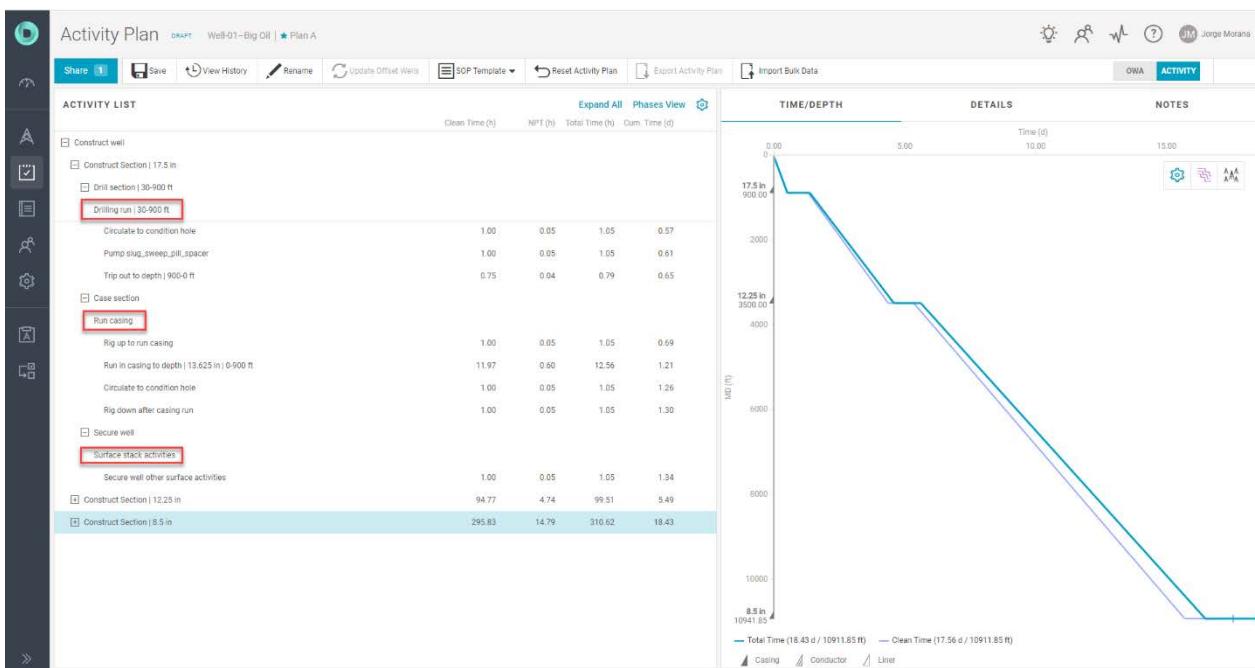
Note: To delete any new or existing activity run, select the run in the Scheduler and in the Edit Run callout, select Delete.

4.13.3 Example of Adding activities to the Scheduler



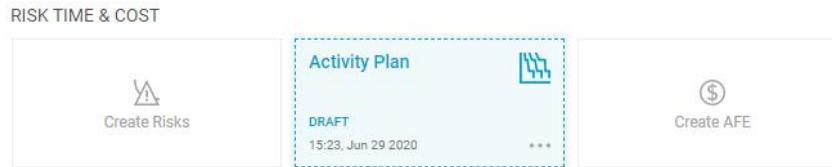
- Go to the Plan page icon. Locate the “Create Activity Plan” object in the “RISK TIME & COST” tag and click on it.
- This should generate an initial activity plan exactly with the default activities generated in the Scheduler View for each section, which are:
 - Drilling Run
 - Run Casing
 - Surface stacks activities

You should have the activity plan generated that looks like this:



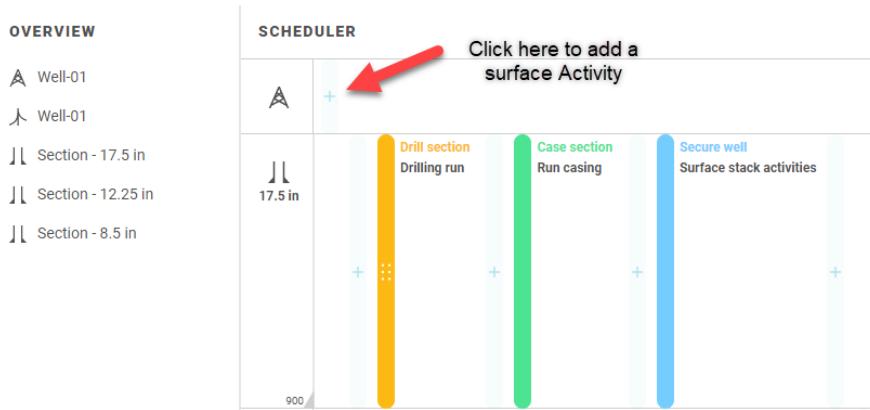
The clean time computer is coming from the default SOP (Standard Operating Procedure) template, that you can find in the corporate setting

- Save the activity plan but don't share it. You should have a draft version. Showing like this



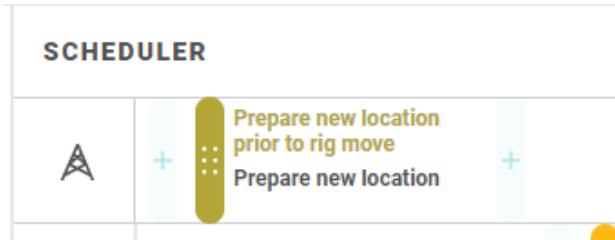
4. Go to the Plan page  icon. Click on the Scheduler tab

On the top, where you see the Rig Icon, click on the plus sign, to add an activity



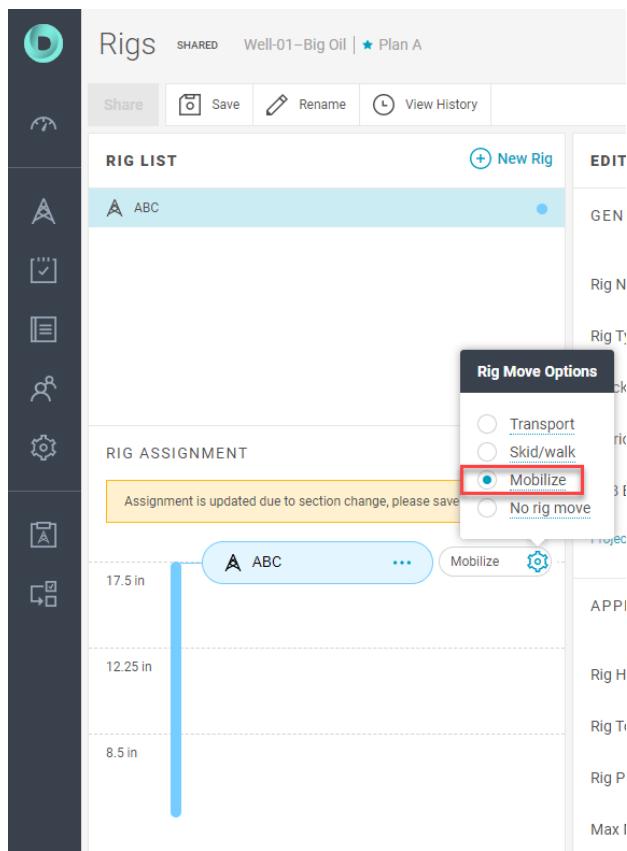
5. A popup window shows up, in the Activity dropdown list select: "Prepare new Location prior to rig move".
6. Then in the Activity Pond select "Prepare new location".
7. Lastly, put some comments like: "All activities that has to be done prior the rig arrives to the location, billable to this project", and click "Add"

You should see this:

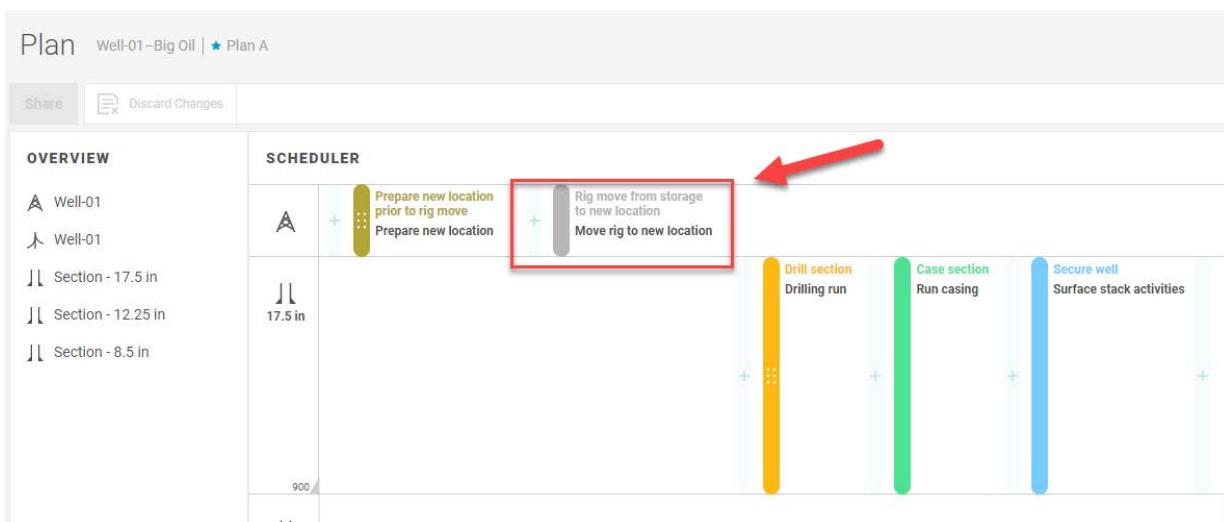


This are custom activities based on your SOP template.

8. Go back to your Plan View and click on your Rig Object, go to the wear icon a change the selection from “No Rig Move” to mobilize, as shown

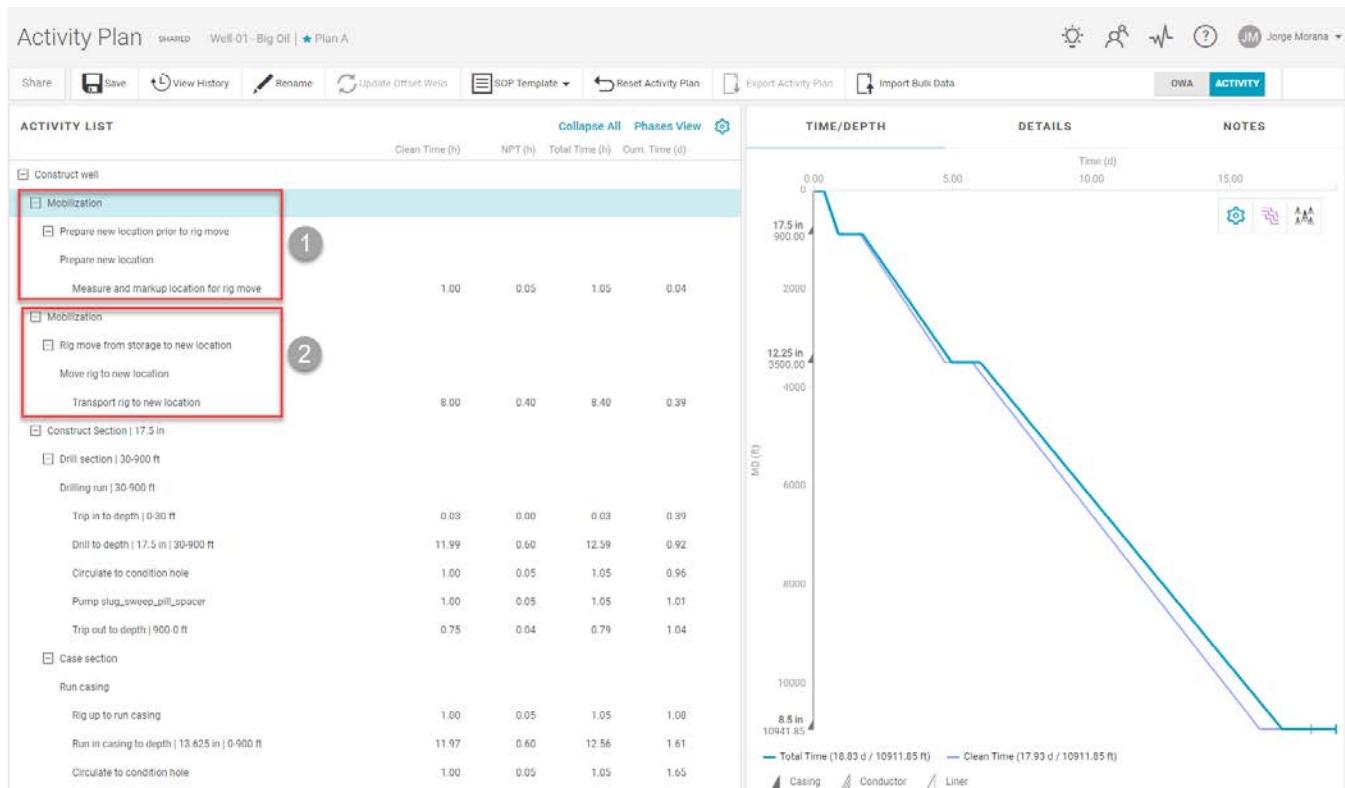


9. Save and share again.
10. Choose again your scheduler tab and you should see, the following:



11. Coming back to the Plan view, choose again your “Activity Plan Object” and you should see how the Activity Plan has changed reflecting these new activities

12. Click on Expand All button to see details of the activities



13. Save and Share

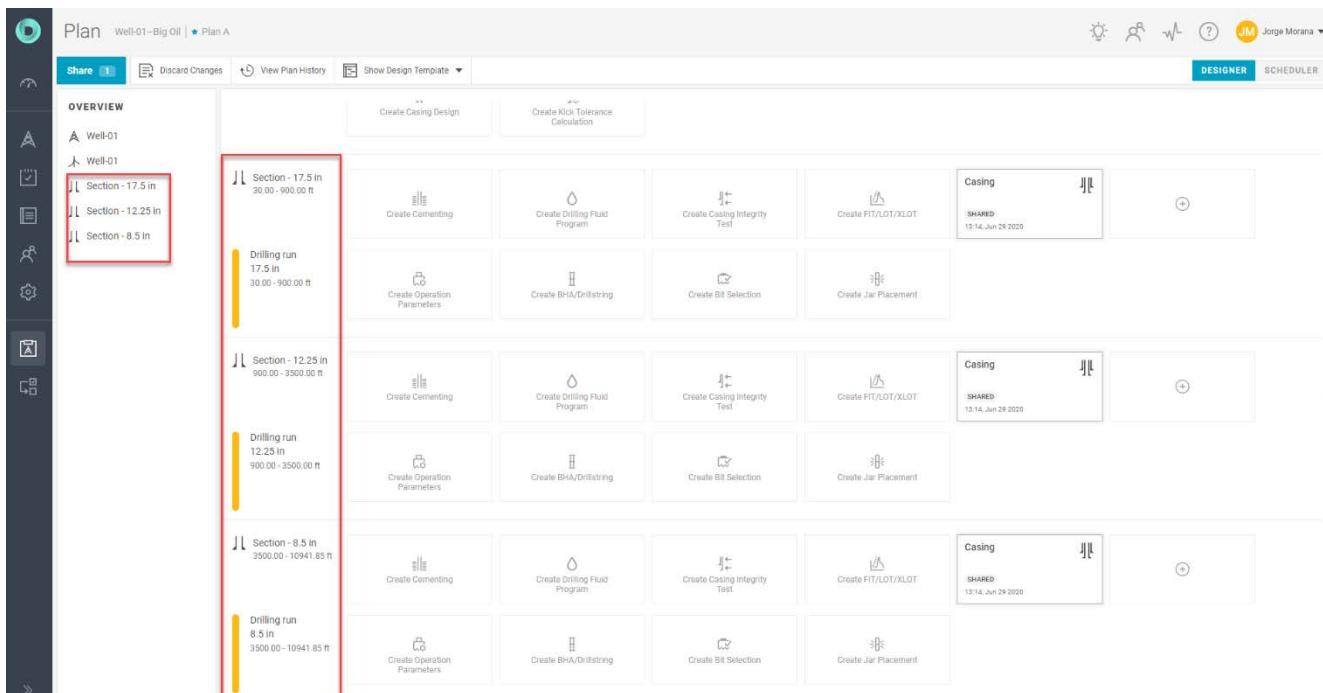
In conclusion, the Scheduler is based on the wellbore geometry data, the runs on the Plan page, the domain objects and the predefined activity template.

4.14 Cement Jobs



Go to the Plan page icon . You should see and this moment the following new sections levels for 17.5", 12.25" and 8.5".

Here we will be able to add objects at the section level like: Cement, Drilling fluids and later the different runs for BHA's.



1. Click on the "Create Cementing" object for the 17.5" section.
2. Click on "Rename" and change the object name to: "17.5" Cementing Job"
3. Enter the values of Shoe Track Length of 50 ft and a Cementing wait time of 3 h.
In the bottom table, input Lead cement, density 12.8 ppg; tail cement, density 15.6 ppg; tail cement fluid top MD 500 ft

This is the view for the 17.5" Cementing Job object



17.5" Cementing SHARED TryMe-DrillPlan | TeamPlan | Section 17.5 in

Share Save Rename

Annular Open Hole Excess%	0.00 %	Effective OH Diameter(s)	17.500 in	Annular OH Excess Volume	0.00 bbl
Waiting on Cement	3.00 h				
Stab-in Cementing Method					
Show Dry Cement Quantity					
2-Stage Cementing					

1ST STAGE CEMENT DEFINITION

Shoe Track length *	50.00 ft	Shoe Track MD	850.00 ft	Shoe Track Volume	7.44 bbl
---------------------	----------	---------------	-----------	-------------------	----------

TYPE	DESCRIPTION	DENSITY (lbm/gal)	PUMPED EXCESS ... (%)	FLUID TOP MD (ft)	ANNULAR LENGTH (ft)	TOTAL VOLUME (bbl)	COMMENTS
Lead		12.80		0.00	Error	Error	
Tail		15.60		500.00	400.00	54.30	

The cement job just created will have an effect on your Activity Plan. Go to the plan view and select again your activity plan and you will see a new main activity added. This is in the Construct Section 17.5, you should see the Cement section.

Activity Plan SHARED Well-01-Big Oil | Plan A

Share Save View History Rename Update Offset Wells SOP Template Reset Activity Plan Export Activity Plan Import Bulk Data OWA ACTIVITY

ACTIVITY LIST		TIME/DEPTH				DETAILS	NOTES
		Clean Time (h)	NPT (h)	Total Time (h)	Cum. Time (d)		
<input type="checkbox"/> Construct well							
<input type="checkbox"/> Mobilization		72.00	3.60	75.60	3.15		
<input type="checkbox"/> Mobilization		8.00	0.40	8.40	3.50		
<input type="checkbox"/> Construct Section 17.5 in							
<input type="checkbox"/> Drill section 90-900 ft		14.77	0.74	15.51	4.15		
<input type="checkbox"/> Case section		15.43	0.77	16.21	4.82		
<input type="checkbox"/> Cement section							
Cement casing							
Rig up to cement casing		1.00	0.05	1.05	4.87		
Perform single stage cement job		11.80	0.59	12.39	5.38		
Rig down after cementing casing		1.00	0.05	1.05	5.43		
<input type="checkbox"/> Secure well		13.00	0.65	13.65	5.99		
<input type="checkbox"/> Construct Section 12.25 in		95.74	4.79	100.53	10.18		
<input type="checkbox"/> Construct Section 8.5 in		295.63	14.79	310.62	22.12		

TIME/DEPTH

Repeat the same process for 12.25" cementing job and 8.5" cementing job

CEMENT JOBS TABLE

Section	Type	Shoe Track Length	Cement Waiting Time (h)
17.5	Single stage	40	3
12.25	Single stage	80	3
8.5	Single stage	60	6

- i. Go  to the Plan page icon . Click on the “Create Cementing” object at the 12.25" Section
- ii. Click on “Rename” and change the object name to: “12.25" Cementing Job”
- iii. Enter the values of Shoe Track Length of 80 ft and a Cementing wait time of 3 h, as it is indicated in the Cementing Job Table
- iv. When done remember to save, share and complete and set the progress bar accordingly.

This is the view for the 12.25" Cementing Job object

12.25" Cementing SHARED Jorge_Well-01-San Felipe | Plan A | Section 12.25 in

Share Save Rename View History Complete

CEMENTING PROGRAM

Shoe Track Length	80.00	ft	3420.00	ft RKB
Waiting on Cement	3.00	h		
Stab-in Cementing Method	<input checked="" type="checkbox"/>			
2-Stage Cementing	<input checked="" type="checkbox"/>			
Stage Distance from the Shoe		ft		ft RKB

CEMENTS WEIGHTS AND ANNULUS LENGTHS

✓	NAME	DENSITY (lbm/gal)	LENGTH (ft)	TOP DEPTH (ft RKB)	IS CEMENT
	Add a new row to the table				



This is the view for the 8.5" Cementing Job object

8.5" Cementing

SHARED Jorge_Well-01-San Felipe | Plan A | Section 8.5 in

Share Save Rename View History Complete

CEMENTING PROGRAM

Shoe Track Length	<input type="text" value="58.84"/>	ft	<input type="text" value="10802.00"/>	ft RKB
Waiting on Cement	<input type="text" value="6.00"/>	h		
Stab-in Cementing Method	<input type="checkbox"/>			
2-Stage Cementing	<input type="checkbox"/>			
Stage Distance from the Shoe	<input type="text"/>	ft	<input type="text"/>	ft RKB

CEMENTS WEIGHTS AND ANNULUS LENGTHS

	NAME	DENSITY (lbm/gal)	LENGTH (ft)	TOP DEPTH (ft RKB)	IS CEMENT
	lead	12.00	6360.84	4000.00	<input checked="" type="checkbox"/>
	tail	15.00	500.00	10360.84	<input checked="" type="checkbox"/>

- v. Users can also click on the sign and add NAME (mud, spacer, lead cement, or tail cement...) of the fluid in annulus, DENSITY and annulus LENGTH in the table below to add cement and fluid density and length for each fluid interval added.

IS CEMENT
<input type="checkbox"/>

If the fluid is cement, turn on the IS CEMENT button . This allows the casing design to apply the cement density and hydrostatic in the As Cemented and Green Cement external load cases profile.

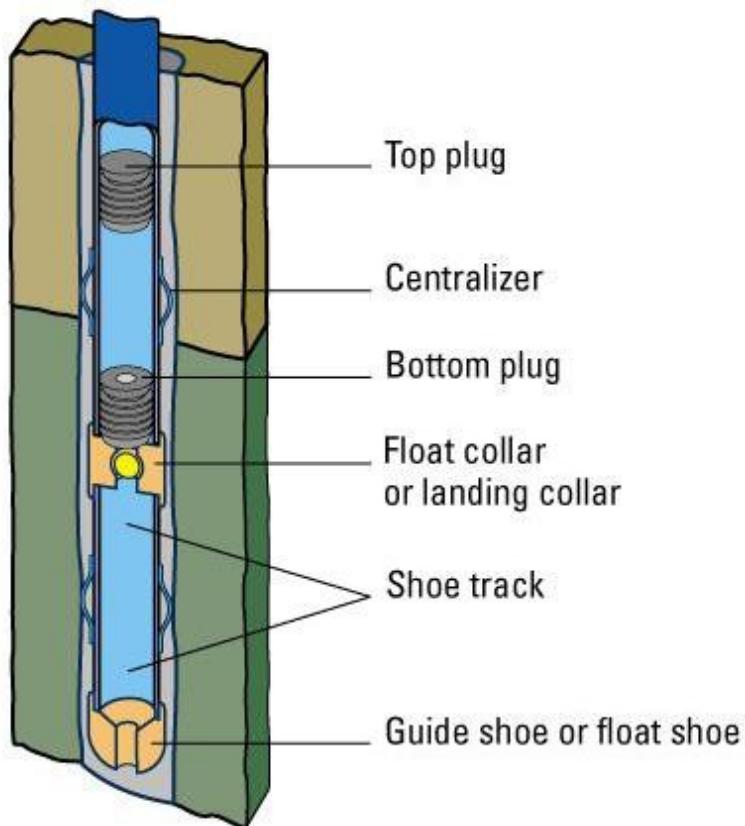


Note: The numbers showed may vary because it depends of the final MD of the 8.5" Section. What is important is to have the Top Depth of the lead cement set at 4000 ft from RKB, as it was defined on the TOC in the Wellbore Geometry of this section.

CEMENTS WEIGHTS AND ANNULUS LENGTHS

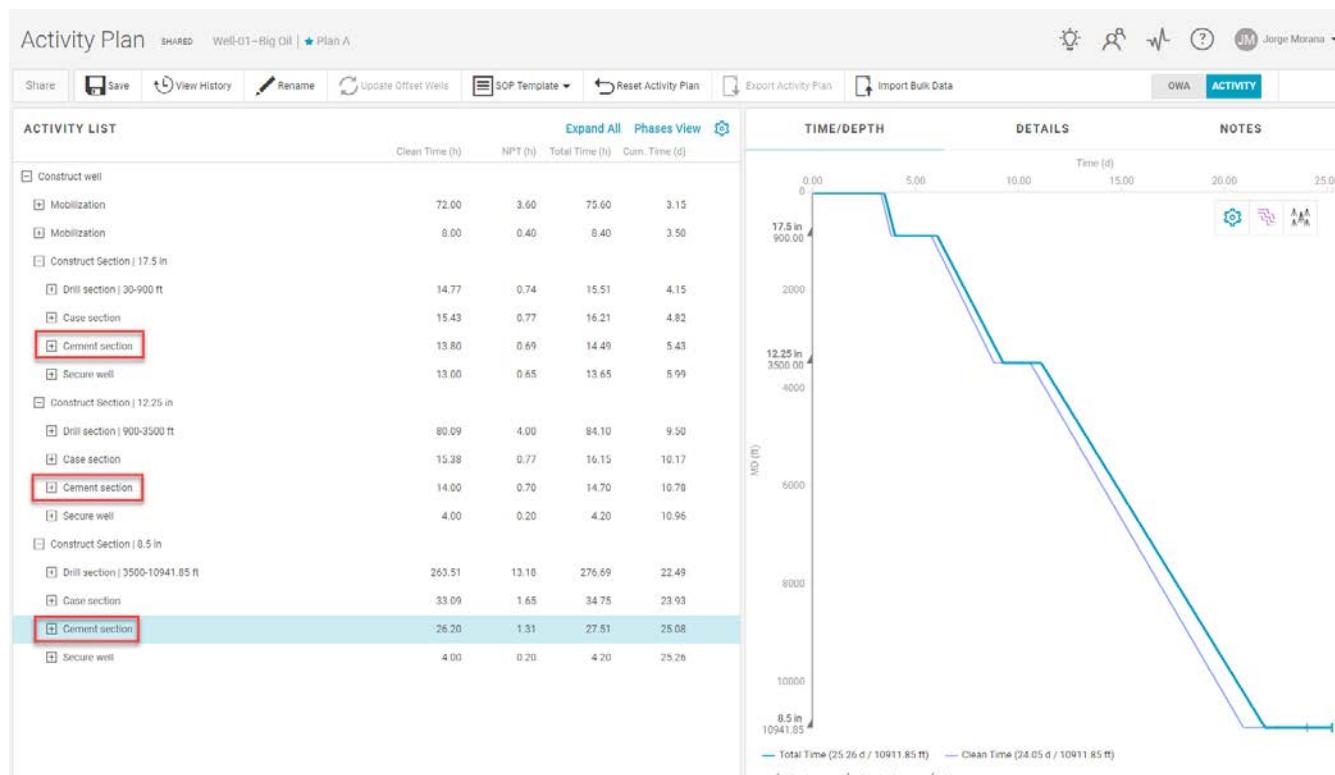


NAME	DENSITY (lbm/gal)	LENGTH (ft)	TOP DEPTH (ft RKB)	IS CEMENT
lead	12.00	6360.84	4000.00	<input checked="" type="checkbox"/>
tail	15.00	500.00	10360.84	<input checked="" type="checkbox"/>



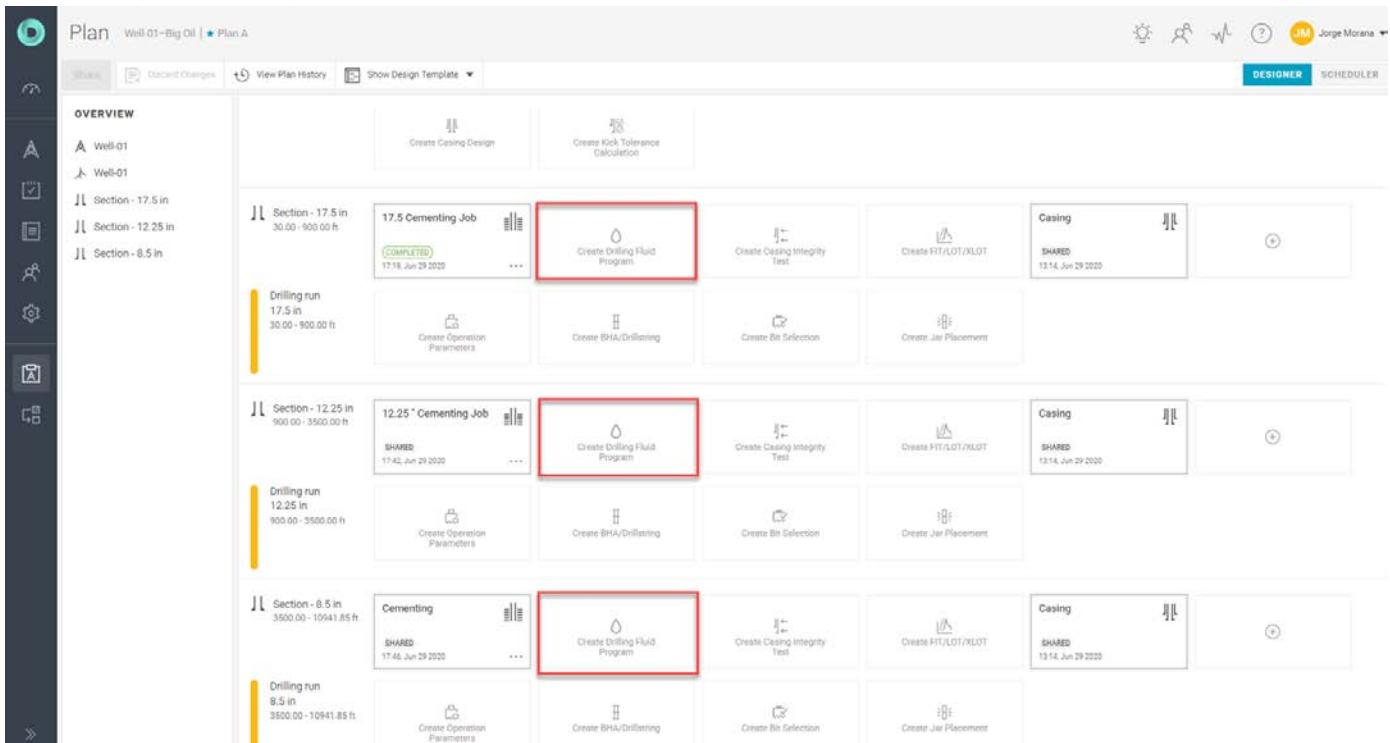
- vi. Click on **TASKS**  icon, go to the **SECTIONS** Group and select the “Cement Jobs” Task and Move the progress bar to 100% to set the task as completed.

Finally, an overall view of the “Activity Plan” and how it was changed by adding the Cements Jobs



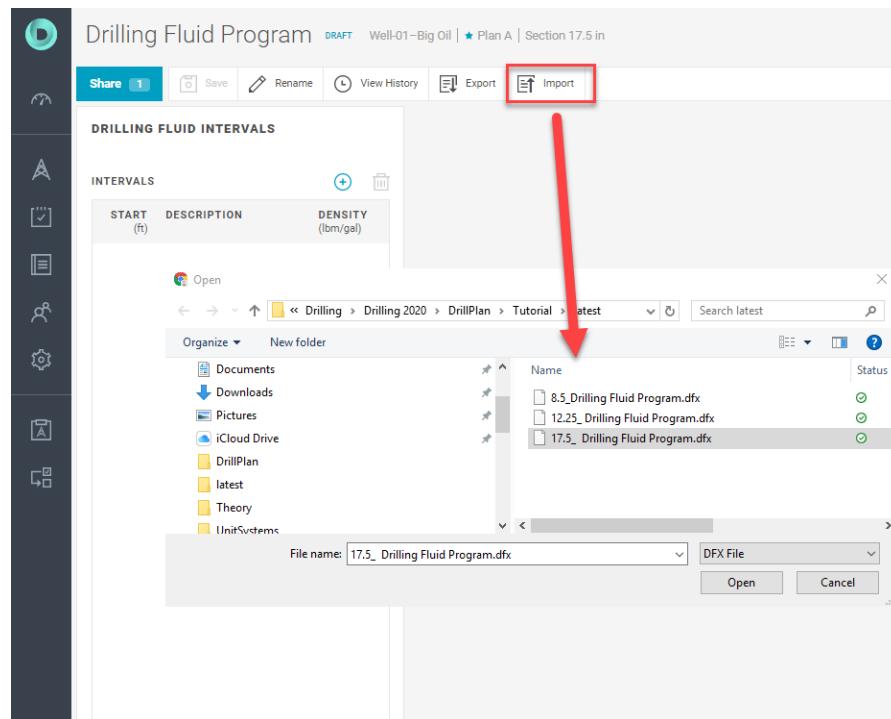
4.15 Drilling Fluid Program

Similarly, to how we have done other objects, the drilling fluid program will allow you to create a detailed fluid composition analysis.



The screenshot shows the DrillPlan software interface with the 'Plan' tab selected. On the left, there's a sidebar with icons for Well, Stack, Document Changes, View Plan History, Show Design Template, DESIGNER (highlighted in blue), and SCHEDULER. The main area is titled 'OVERVIEW' and shows a list of wells: Well-01, Well-01, Section - 17.5 in, Section - 12.25 in, and Section - 8.5 in. Below this, there are three horizontal rows representing different sections: 17.5 in, 12.25 in, and Cementing. Each section has a 'Drilling run' and a 'Cementing Job'. In each row, the third item from the left is 'Create Drilling Fluid Program', which is highlighted with a red box. The 'Cementing' section also has a 'Create Drilling Fluid Program' item highlighted.

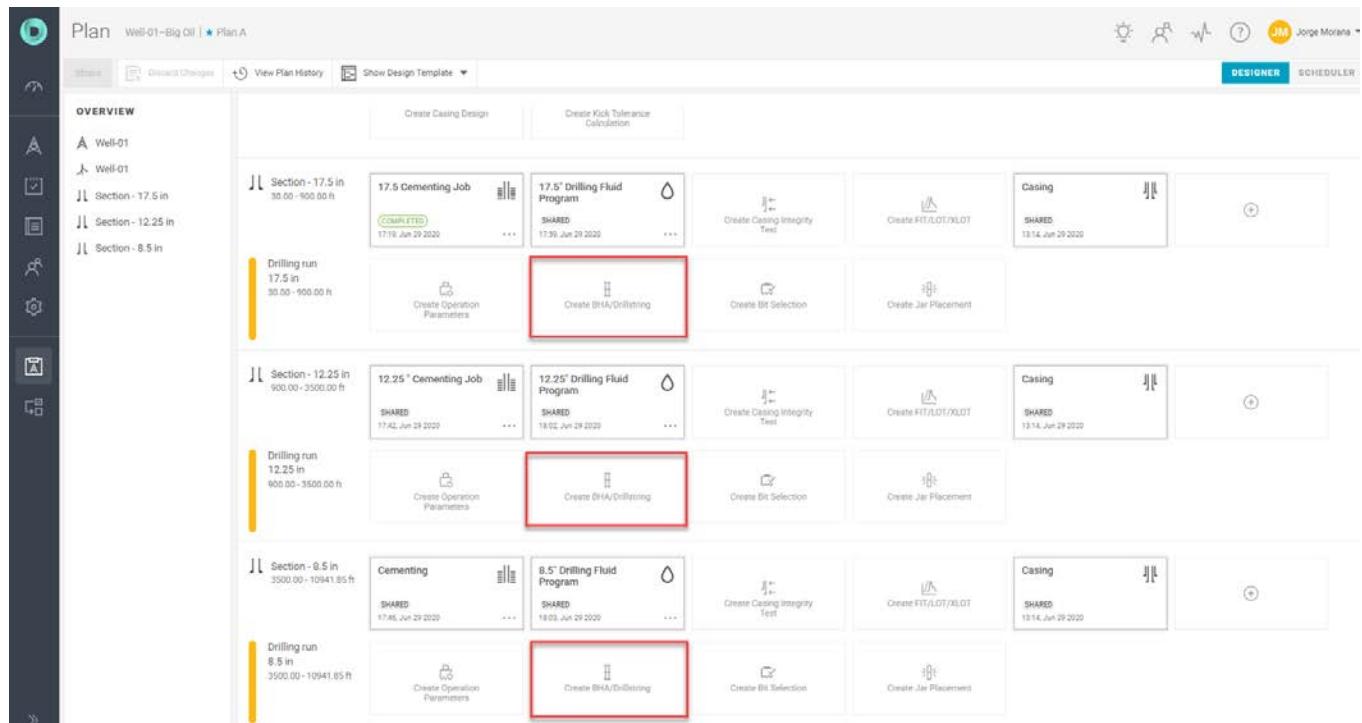
- vii. Go  to the Plan page icon . As it is indicated in the previous screenshot , go to the 17.5" Section and select the **"Create Drilling Fluid Program"** object.
- viii. Click on "Rename" and change the object name to: "17.5" Drilling Fluid Program"
- ix. For the demonstration, the Import  option will be used to populate the drilling fluids programs. Use the files provided, ending with the extension .dfx and names with each respective section, to populate the Drilling Fluid program details. For example, use the *17.5_Drilling Fluid Program.dfx* file for the 17.5in section.



- x. When all done, Share the object. A confirmation window will show you all elements to be shared. Leave them all ticked, confirm to Share. Repeat the same for the 12.25in and 8.5in sections.
- xi. At this point you should have this view when you are in the Plan page icon

4.16 Design BHA/Drillstring

We already have the 3 sections generated and the default Drilling Runs. Locate the “Create BHA/Drilling” Object per each drilling run that looks like:

The screenshot shows the DrillPlan software interface. On the left is a sidebar with a tree view of well sections: Well-01, Well-01, Section - 17.5 in, Section - 12.25 in, and Section - 8.5 in. The main area is the 'OVERVIEW' tab for Well-01-Big Oil, Plan A. It displays three drilling runs:

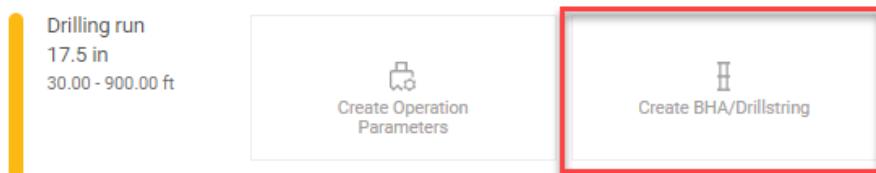
- Drilling run 17.5 in 30.00 - 900.00 ft:** Contains a '17.5" Cementing Job' (COMPLETED) and a '17.5" Drilling Fluid Program' (SHARED). The 'Create BHA/Drillstring' object is highlighted with a red box.
- Drilling run 12.25 in 900.00 - 3500.00 ft:** Contains a '12.25" Cementing Job' (SHARED) and a '12.25" Drilling Fluid Program' (SHARED). The 'Create BHA/Drillstring' object is highlighted with a red box.
- Drilling run 8.5 in 3500.00 - 10941.85 ft:** Contains a 'Cementing' job (SHARED) and an '8.5" Drilling Fluid Program' (SHARED). The 'Create BHA/Drillstring' object is highlighted with a red box.

At the top right, there are tabs for 'DESIGNER' and 'SCHEDULER'. Below the tabs are buttons for 'Create Casing Design', 'Create Kick Tolerance Calculation', 'Create Casing Integrity Test', 'Create FIT/LDT/XLD/T', and 'Create Casing'. To the right of these buttons are buttons for 'Create Bit Selection' and 'Create Jar Placement'.

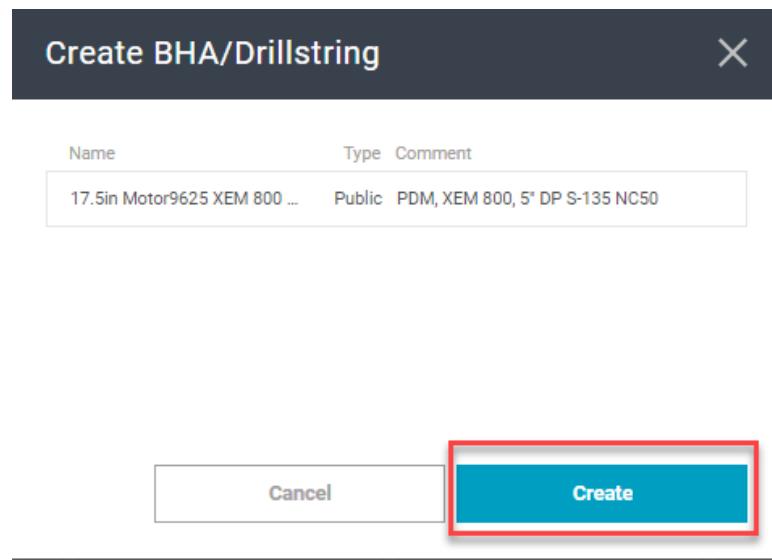
4.16.1 Import a BHA&Drillstring design

You can import a BHA&Drillstring design in the WITSML 1.3.1 or 1.4.1 format from other applications.

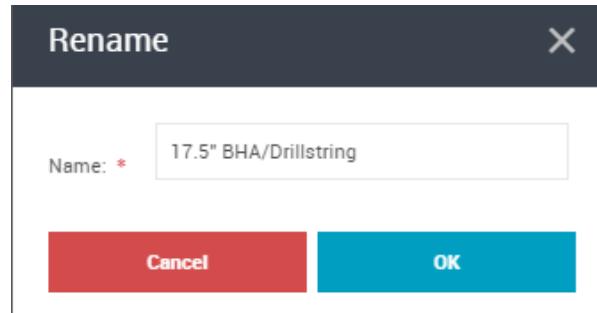
1. Go to the Plan page icon .
2. Identify the Drilling Run for the 17.5" Run.



3. Click on the “Create BHA/Drillstring” object for the 17.5” section Drilling Run. Then click on the “create” button.



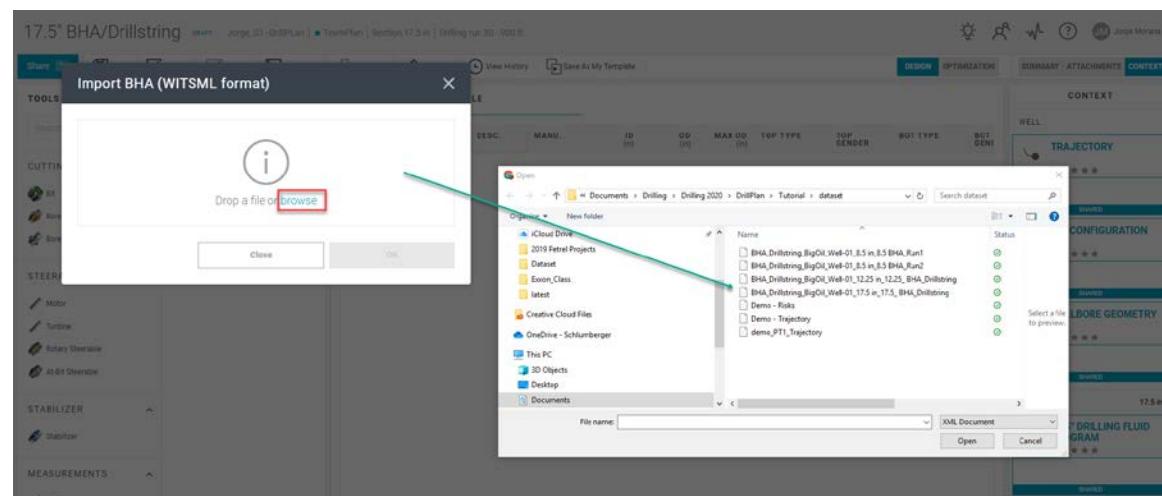
4. Click on the “Rename” menu button from the top ribbon and set the title of this object as: 17.5" BHA



5. Then, select Import icon  from the top ribbon and browse for the file *Demo - 17.5 BHA.xml*.

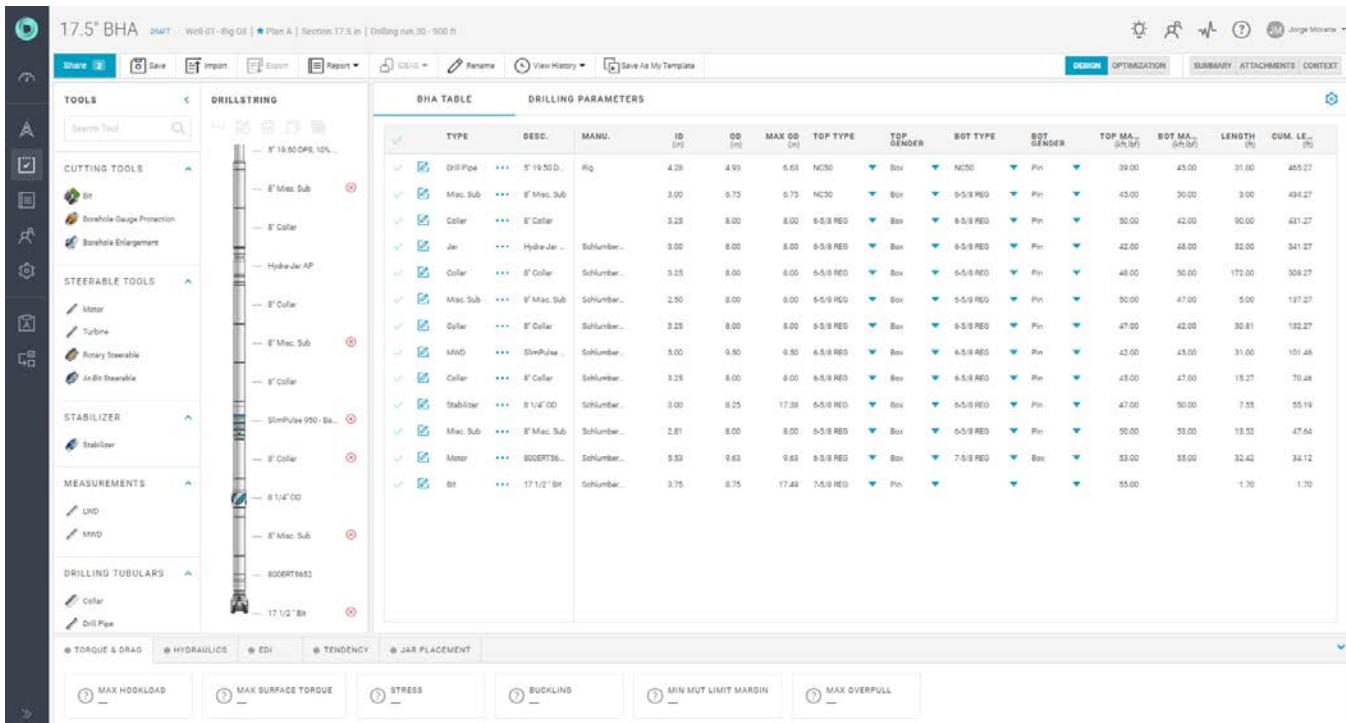


6. Click on “Browse”, bring in the file “BHA_Drillstring_BigOil_Well-01_17.5 in_17.5_BHA_Drillstring.xml” and click “OK”



7. Click on “Save” and Share

Once done, your BHA&Drillstring editor page should look like this:



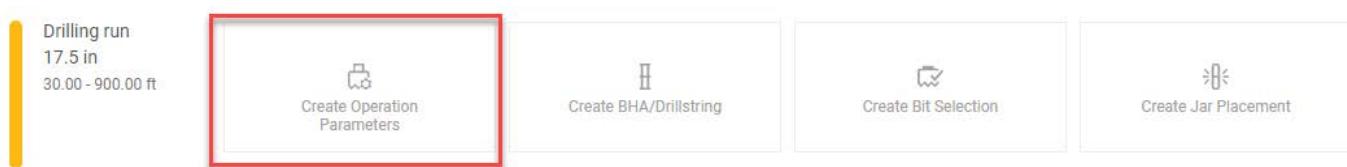
When done, remember to Save, Share and set the progress bar accordingly.

On the bottom side, you will see the Automatic Engineering Analysis (AEA) providing no results. We are still missing the drilling parameters.

4.16.2 Drilling Parameters

In DrillPlan, all drilling sections need drilling parameters. This information is used by the different DrillPlan engines to compute torque & drag and hydraulics among others. The access to the drilling parameters is done through the BHA page.

1. Click on your Plan View 
2. Go to the 17.5" Section, Drilling Run, and select “Create Operation Parameters” object.



3. Locate the “Batch Input” menu and click on it



4. Then, type in the following parameters

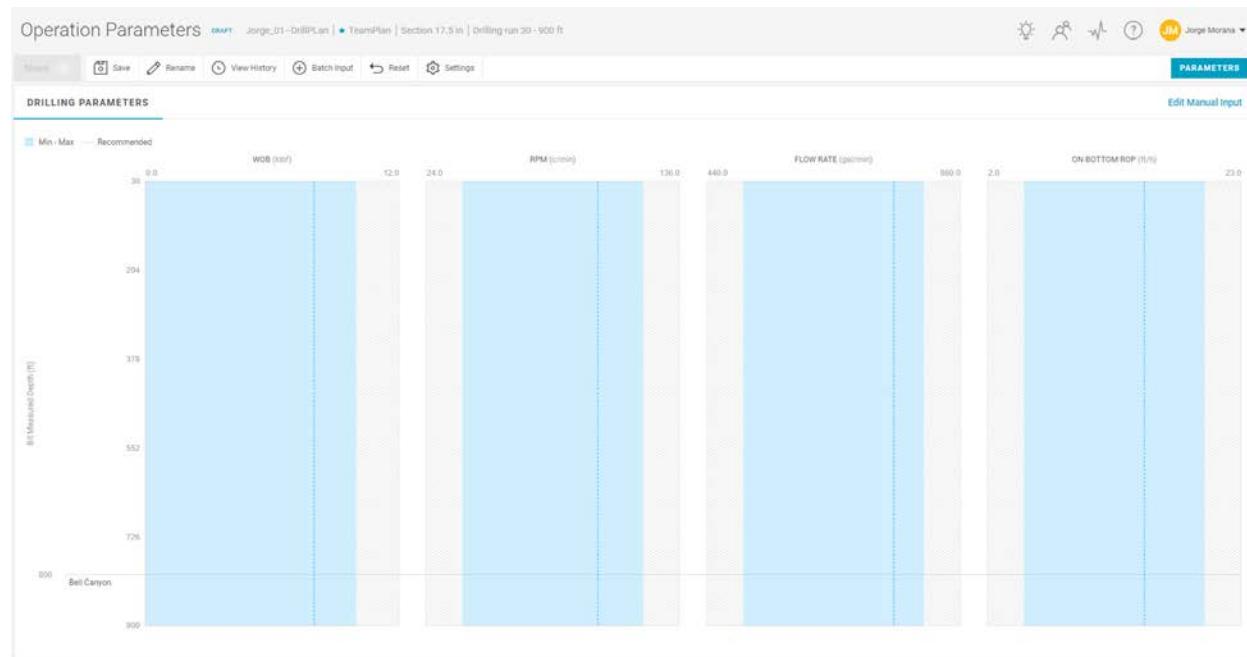
For the 17.5" section enter the following parameters using the **Batch Input** option:

Section	Run	WOB (klbf)	RPM (c/min)	Flow Rate (gal/min)	ROP (ft/h)
17.5"	Run 1	0-10-8	40-120-100	500-800-750	5-20-15

Add Manual Input In Batch

Start MD	30.00	ft	<input checked="" type="checkbox"/> Tie to	Run Start	<input type="button" value="▼"/>
Run Start	30.00 ft	Offset MD	0.00	ft	
End MD	900.00	ft	<input checked="" type="checkbox"/> Tie to	Run End	<input type="button" value="▼"/>
Run End	900.00 ft	Offset MD	0.00	ft	
	Min	Max	Recommended		
WOB	0.00	–	10.00	klbf	8.00 klbf
RPM	40.00	–	120.00	c/min	100.00 c/min
Flow Rate	500.00	–	800.00	gal/min	750.00 gal/min
On Bottom ROP	5.00	–	20.00	ft/h	15.00 ft/h

5. Click on “Add 12 Parameters”



6. Go to the page menu, locate “Setting” and click on it



For the 17.5" section enter the following parameters using the Setting option:

Section	Run	Bit Torque (kft.lbf)	Motor Diff. Pressure (psi)	Reaming RPM (c/min)	Reaming Speed (ft/h)
17.5"	Run 1	0-10	300	80	200

Operation Parameter Settings

Bit Torque	0.00	—	10.00	kft.lbf	Motor Differential Pressure	300.00	psi
Reaming RPM	80.00	c/min			Reaming Speed	200.00	ft/h
Stand Length	100.00	ft			Connection Time	20.00	min

FRICITION FACTOR

NAME	ROTATIONAL	TRANSLATIONAL
Cased hole	0.20	0.20
Open hole	0.30	0.30

Cancel
Apply

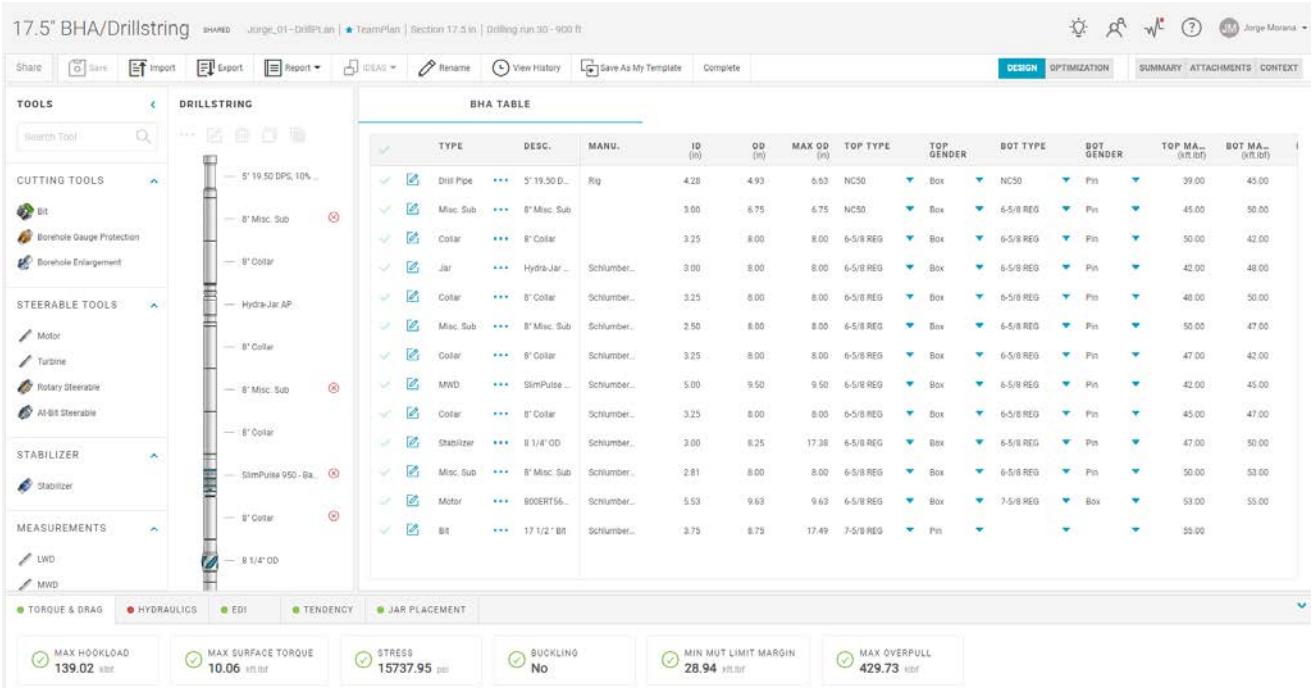
9. To finalize this process, select Apply.

10. Click on “Save” and then “Share”



Once done, your BHA&Drillstrings for this section should look like this: The engineering results will calculate when all objects in Context are done.

17.5 BHA



The screenshot shows the DrillPlan software interface for a 17.5" BHA/Drillstring. The top navigation bar includes options like Share, Save, Import, Export, Report, Ideas, View History, Save As My Template, Complete, DESIGN, OPTIMIZATION, SUMMARY, ATTACHMENTS, and CONTEXT. The main area is divided into two sections: DRILLSTRING and BHA TABLE.

DRILLSTRING: A vertical diagram of the drillstring components. From top to bottom, it includes: 5' 19.50 DPS, 10% Tapered Bit, 8' Misc. Sub, 8' Collar, Hydra-Jar AP, 8' Collar, 8' Misc. Sub, 8' Collar, 8' Collar, 8' Collar, 8' Collar, 8' Collar, 8' Collar, 8' 1/4" OD, and a 17 1/2" BIT.

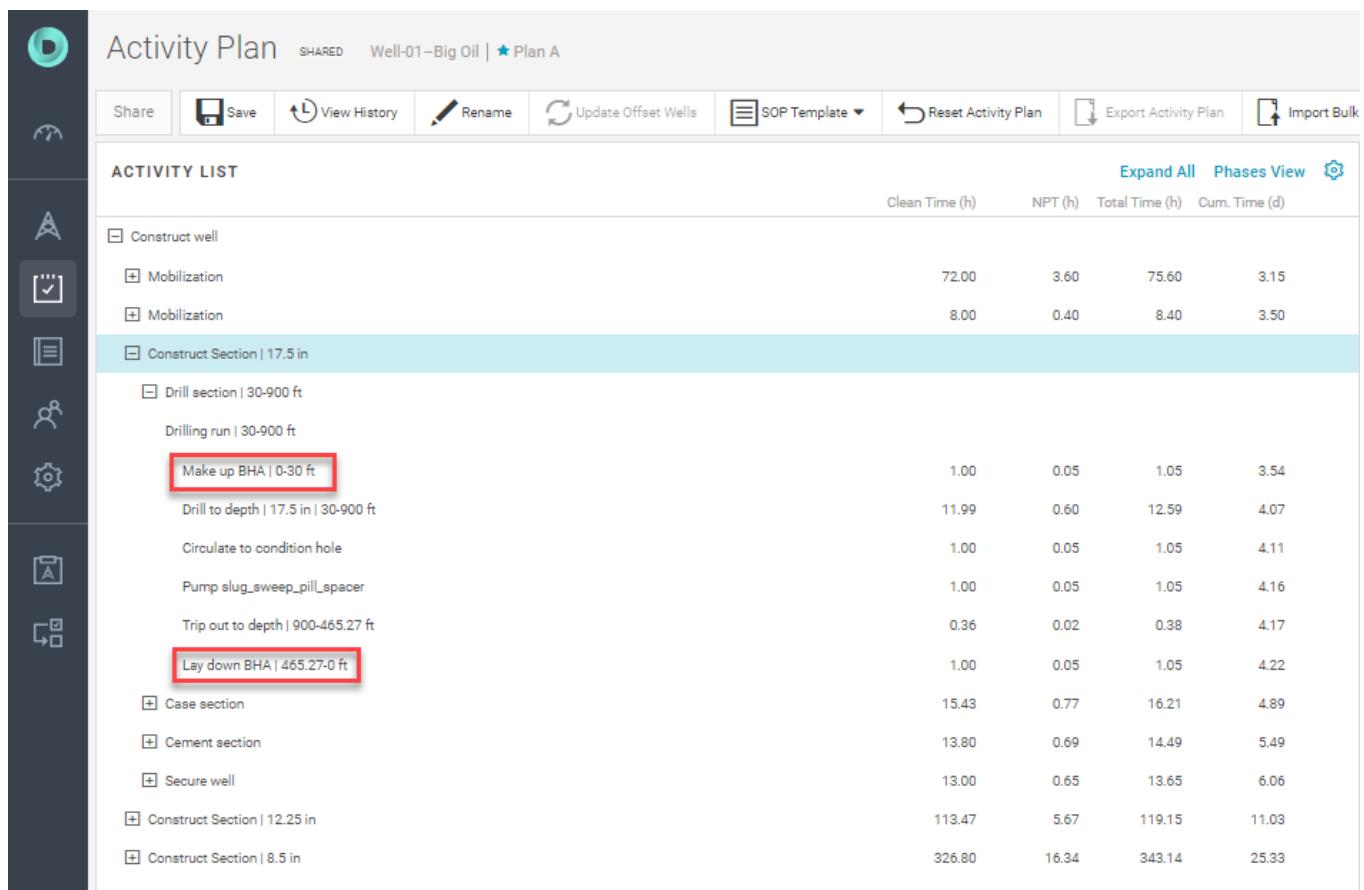
BHA TABLE: A detailed table listing each component with its type, description, manufacturer, ID, OD, max OD, top type, top gender, bot type, bot gender, top margin, and bot margin.

Type	Desc.	Manuf.	ID (in)	OD (in)	Max OD (in)	Top Type	Top Gender	Bot Type	Bot Gender	Top Margin (in,ft)	Bot Margin (in,ft)
Drill Pipe	5' 19.50 DPS, 10% Tapered	Rig	4.28	4.93	6.63	NC50	Box	NC50	Pin	39.00	45.00
Misc. Sub	8' Misc. Sub		3.00	6.75	6.75	NC50	Box	6-5/8 REG	Pin	45.00	50.00
Collar	8' Collar	Schlumberger	3.25	8.00	8.00	6-5/8 REG	Box	6-5/8 REG	Pin	50.00	42.00
Jar	Hydra-Jar AP	Schlumberger	3.00	8.00	8.00	6-5/8 REG	Box	6-5/8 REG	Pin	42.00	48.00
Collar	8' Collar	Schlumberger	3.25	8.00	8.00	6-5/8 REG	Box	6-5/8 REG	Pin	48.00	50.00
Misc. Sub	8' Misc. Sub	Schlumberger	2.50	8.00	8.00	6-5/8 REG	Box	6-5/8 REG	Pin	50.00	47.00
Collar	8' Collar	Schlumberger	3.25	8.00	8.00	6-5/8 REG	Box	6-5/8 REG	Pin	47.00	42.00
MWD	SlimPulse	Schlumberger	5.00	9.50	9.50	6-5/8 REG	Box	6-5/8 REG	Pin	42.00	45.00
Collar	8' Collar	Schlumberger	3.25	8.00	8.00	6-5/8 REG	Box	6-5/8 REG	Pin	45.00	47.00
Stabilizer	8 1/4" OD	Schlumberger	3.00	8.25	17.38	6-5/8 REG	Box	6-5/8 REG	Pin	47.00	50.00
Misc. Sub	8' Misc. Sub	Schlumberger	2.81	8.00	8.00	6-5/8 REG	Box	6-5/8 REG	Pin	50.00	53.00
Motor	800ERT56	Schlumberger	5.53	9.63	9.63	6-5/8 REG	Box	7-5/8 REG	Box	53.00	55.00
BIT	17 1/2" BIT	Schlumberger	3.75	8.75	17.49	7-5/8 REG	Pin				

Bottom of the screen displays engineering results:

- MAX HOOKLOAD: 139.02 kNf
- MAX SURFACE TORQUE: 10.06 kNm
- STRESS: 15737.95 psi
- BUCKLING: No
- MIN MUD LIMIT MARGIN: 28.94 kPa
- MAX OVERPULL: 429.73 kNf

Let's see how the BHA object affects the Activity Plan on the 17.5" Section. Going back to the Plan View, by selecting the "Activity Plan" Object we should get:



ACTIVITY LIST

	Clean Time (h)	NPT (h)	Total Time (h)	Cum. Time (d)
Construct well				
+ Mobilization	72.00	3.60	75.60	3.15
+ Mobilization	8.00	0.40	8.40	3.50
Construct Section 17.5 in				
Drill section 30-900 ft				
Drilling run 30-900 ft				
Make up BHA 0-30 ft	1.00	0.05	1.05	3.54
Drill to depth 17.5 in 30-900 ft	11.99	0.60	12.59	4.07
Circulate to condition hole	1.00	0.05	1.05	4.11
Pump slug_sweep_pill_spacer	1.00	0.05	1.05	4.16
Trip out to depth 900-465.27 ft	0.36	0.02	0.38	4.17
Lay down BHA 465.27-0 ft	1.00	0.05	1.05	4.22
Case section	15.43	0.77	16.21	4.89
Cement section	13.80	0.69	14.49	5.49
Secure well	13.00	0.65	13.65	6.06
Construct Section 12.25 in	113.47	5.67	119.15	11.03
Construct Section 8.5 in	326.80	16.34	343.14	25.33

Two extra activities were added to the drilling run for the 17.5" section. Make Up BHA and Lay down BHA

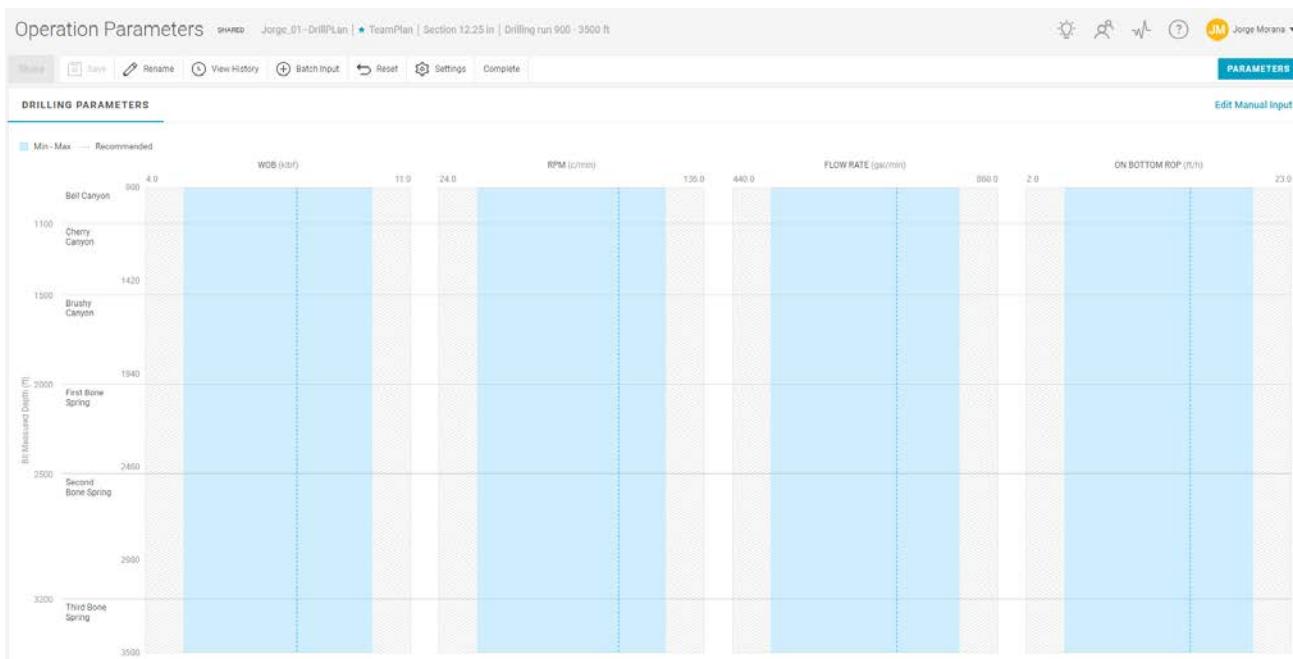
Let's continue with the BHA's and Operations Parameters for 12.25 and 8,5

- Repeat the import process for the 12.25" using the files *BHA_Drillstring_BigOil_Well-01_12.25 in_12.25_BHA_Drillstring.xml*.
- Then, repeat steps 1 to 10 done in 17.5" section for the **12.25" well section**, by using the following parameters:

Section	Run	WOB (klbf)	RPM (c/min)	Flow Rate (gal/min)	ROP (ft/h)	Bit Torque (kft.lbf)	Motor Diff. Pressure (psi)	Reaming RPM (c/min)	Reaming Speed (ft/h)
12.25"	Run 1	5-10-8	40-120-100	500-800-700	5-20-15	2-10	300	80	200

Once your 12.25" BHA and Operations Parameters are done, you should have the following:

12.25 Operations Parameters



12.25" BHA

12.25 BHA COMPLETED

Jorge_01-DrillPlan | ★ TeamPlan | Section 12.25 in | Drilling run 900 - 3500 ft.

Share Import Export Report IDEAS Rename View History Save As My Template DESIGN OPTIMIZATION SUMMARY ATTACHMENTS CONTEXT

TOOLS

- CUTTING TOOLS
 - 5 1/2" DPS, 10%
 - 6 7/8" Misc. Sub
 - 6 5/8" Collar
- STEERABLE TOOLS
 - Hydra-Jar 6 1/2"
 - 6 5/8" Collar
 - 8" Misc. Sub
 - 8" Collar
- STABILIZER
 - Stabilizer
- MEASUREMENTS
 - 8 1/4"OD
 - 8 3/8" Misc. Sub
- UVD
- MWD

DRILLSTRING

BHA TABLE

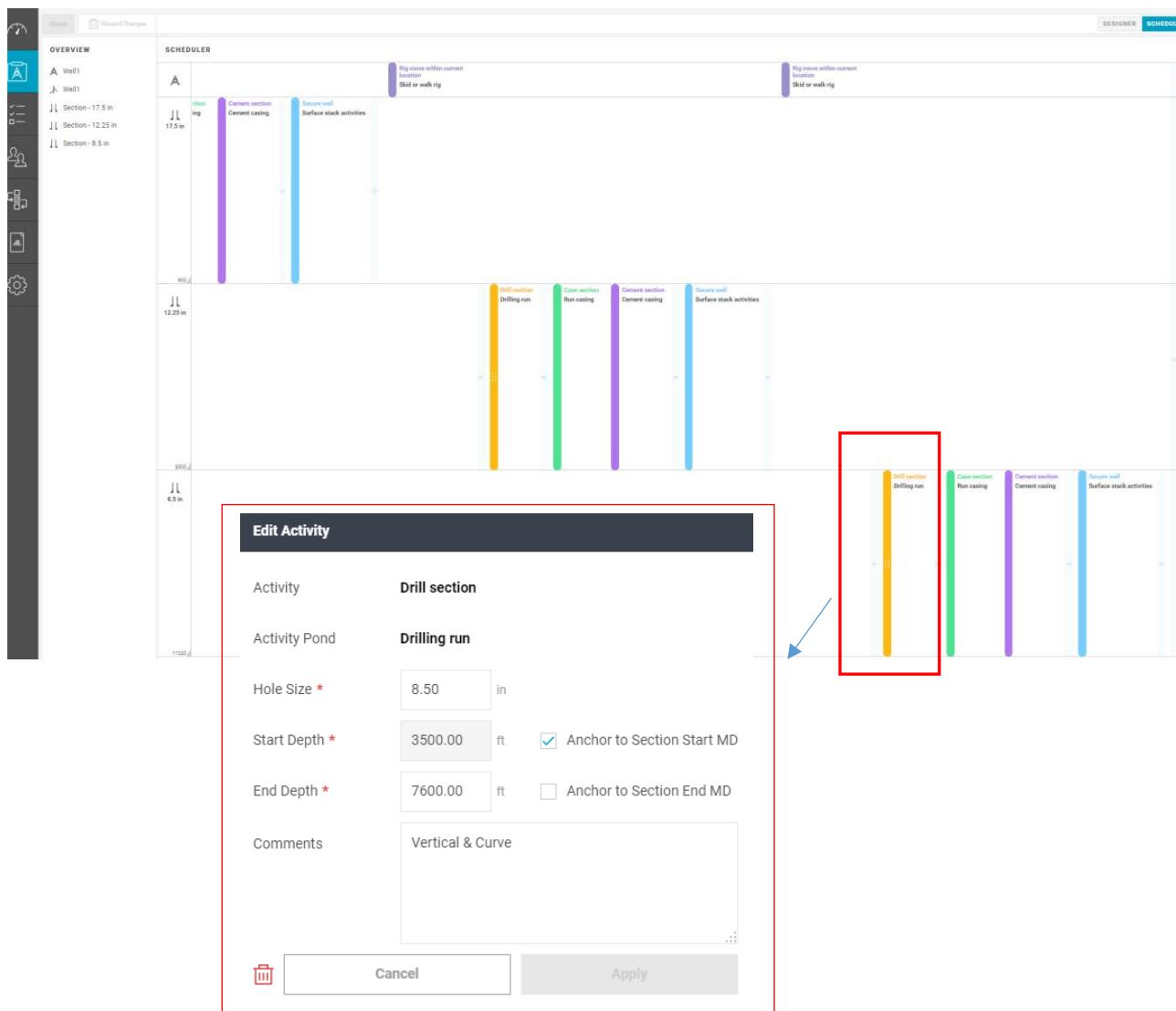
TYPE	DESC.	MANU.	ID (in)	OD (in)	MAX OD (in)	TOP TYPE	TOP GENDER	BOT TYPE	BOT GENDER	TOP MA... (in. of)	BOT MA... (in. of)
Drill Pipe	5 1/2" DPS, 10%	SCHLUMBERGER	4.28	4.93	6.63	4-1/2 IF	Box	4-1/2 IF	Pin	37.00	41.00
Misc. Sub	6 7/8" Misc. Sub	SCHLUMBERGER	2.88	6.73	6.73	4-1/2 IF	Box	4-1/2 XH	Pin	41.00	45.00
Collar	6 5/8" Collar	SCHLUMBERGER	2.81	6.50	6.50	4-1/2 XH	Box	4-1/2 XH	Pin	45.00	46.00
Jar	Hydra-Jar 6 1/2"	SCHLUMBERGER	2.75	6.59	6.59	4-1/2 XH	Box	4-1/2 XH	Pin	46.00	45.60
Collar	6 5/8" Collar	SCHLUMBERGER	2.81	6.50	6.50	4-1/2 XH	Box	4-1/2 XH	Pin	45.60	47.00
Misc. Sub	8" Misc. Sub	SCHLUMBERGER	2.50	8.00	8.00	4-1/2 XH	Box	NCS6	Pin	47.00	47.60
Collar	8" Collar	SCHLUMBERGER	3.00	8.00	8.00	NCS6	Box	NCS6	Pin	47.60	47.70
Collar	8" Collar	SCHLUMBERGER	3.00	8.00	8.00	NCS6	Box	NCS6	Pin	47.70	47.80
Stabilizer	8 1/4"OD	SCHLUMBERGER	2.50	8.25	12.00	NCS6	Box	NCS6	Pin	47.80	47.85
Misc. Sub	8 2/5" Misc. Sub	SCHLUMBERGER	2.50	8.25	8.25	NCS6	Box	6-5/8 FH	Pin	47.85	48.00
MWD	PowerPuls...	SCHLUMBERGER	5.11	8.25	8.41	6-5/8 FH	Box	6-5/8 FH	Pin	48.00	48.00
Misc. Sub	8 2/5" Misc. Sub	SCHLUMBERGER	2.50	8.25	8.25	6-5/8 FH	Box	6-5/8 REG	Pin	48.00	47.00
Stabilizer	8 1/4"OD	SCHLUMBERGER	2.50	8.25	12.00	6-5/8 REG	Box	6-5/8 REG	Pin	47.00	47.00
Motor	A800M784...	SCHLUMBERGER	6.25	8.25	12.13	6-5/8 REG	Box	6-5/8 REG	Box	47.00	47.00

TORQUE & DRAG HYDRAULICS EDI TENDENCY JAR PLACEMENT

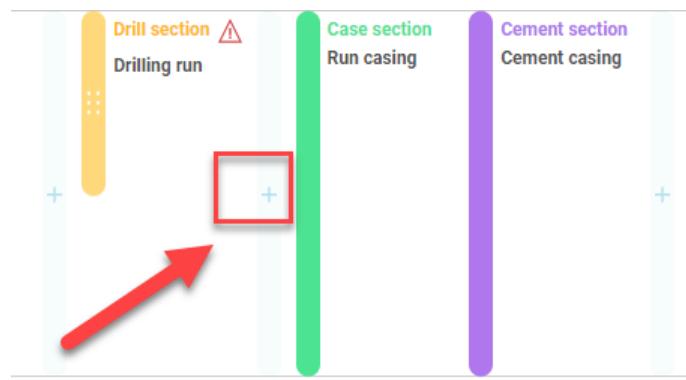
MAX HOOKLOAD 206.21 kNft MAX SURFACE TORQUE 10.88 kNm STRESS 28239.60 psi BUCKLING NO MIN MUD LIMIT MARGIN 26.12 kN/m MAX OVERPULL 367.44 kNft

4.16.3 Editing Runs using the Scheduler

1. Go to the Plan  page icon . Click on the Scheduler , located in the upper right area of your landing page
2. To edit the existing 8.5" default section drilling Run, (1) click on the “Drilling Run” in the 8.5” section, (2) uncheck the “Anchor to the section End MD”, (3) Update the End Depth to: 7600 ft
3. Click Apply. You are going to receive an error that the drilling run is not covering the entire section



4. Click on the plus sign located after the current Drilling Run on the 8.5" Section



5. Select in Activity *: Drill Section and in the Activity Pond*: "Drilling Run"

Edit Activity

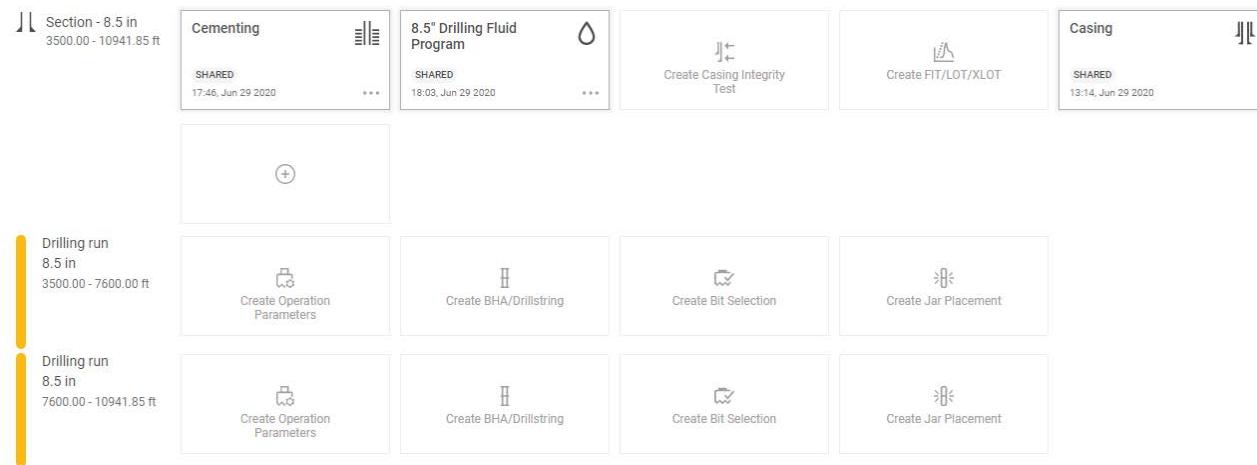
Activity	Drill section	
Activity Pond	Drilling run	
Hole Size *	8.50	in
Start Depth *	7600.00	ft <input type="checkbox"/> Anchor to Section Start MD
End Depth *	10941.85	ft <input checked="" type="checkbox"/> Anchor to Section End MD
Comments	Lateral	
<input type="button" value="Cancel"/> <input type="button" value="Apply"/>		

This will automatically compute the Start Depth for the next run to 7600 and the End Depth anchored to the Trajectory MD.

6. Wait until the scheduler validates that the new runs entries are coherent with the section range.
 7. Click back to the Designer view, there are two runs in the 8.5 Section

Run 1: 3500 – 7600

Run 2: 7600 – 10900 (or the maximum MD of the trajectory)



8. Repeat steps 1 to 10 done in the 17.5 Well section Drilling Run with the using “8.5” _BHA_run1.xml” and “8.5” _BHA_run2.xml”

Run 1: 3500 – 7600

Run 2: 7600 – 10900 (or the maximum MD of the trajectory)

Use the following Drilling Parameters

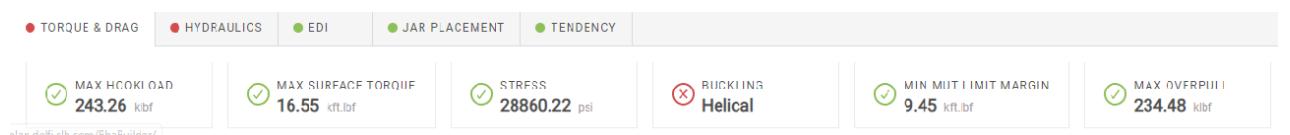
8.5" Drilling Parameters Runs Table

Section	Run	WOB (klbf)	RPM (c/min)	Flow Rate (gal/min)	ROP (ft/h)	Bit Torque (kft.lbf)	Motor Diff. Pressure (psi)	Reaming RPM (c/min)	Reaming Speed (ft/h)
8.5"	Run 1	5-10-8	40-120-100	500-600-580	10-120-100	2-6	500	80	200
8.5"	Run 2	20-30-25	80-140-120	520-600-560	100-300-250	2-5	800	80	200

8.5" section run 1 result



8.5" section run 2 result

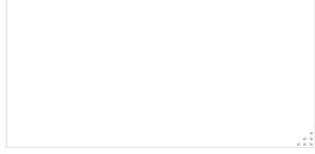


9. Go to  icon, go to the SECTIONS Group and select the “BHA’s” Task
 10. Set the progress bar to 100%

Design BHA&Drillstring Tryme Alex—ACTR

 Rename

TASK INFORMATION

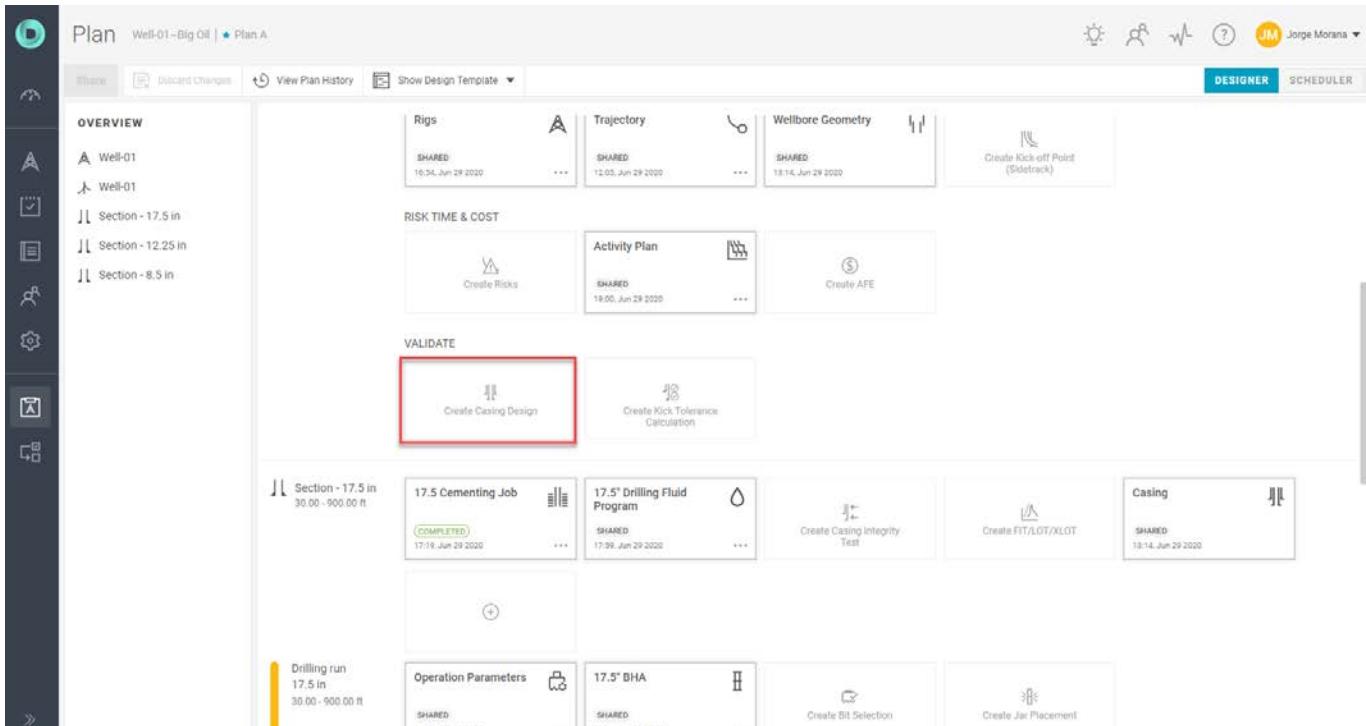
Task Owner	Alex Celis
Group	Sections
Due Date	
Progress	100 % 
Description	

DESIGN BHA&DRILLSTRING

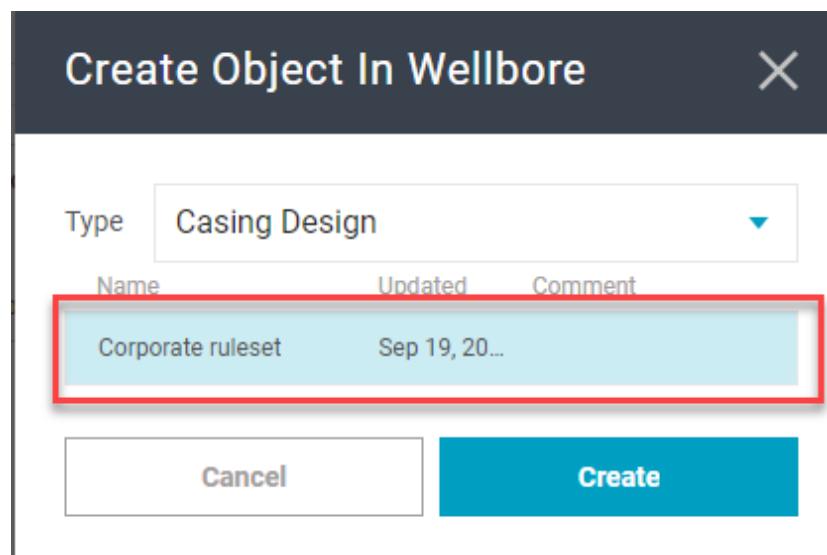
 Section - 17.5 in 30.00 - 900.00 ft	 17.5" Motor BHA COMPLETED 13:13, May 01 2020 
 Section - 12.25 in 900.00 - 3500.00 ft	 12.25" Motor BHA COMPLETED 13:15, May 01 2020 
 Section - 8.5 in 3500.00 - 10941.85 ft	 8.5" Archer BHA Curve COMPLETED 10:29, May 04 2020 
 Drilling run 8.5 in 3500.00 - 7600.00 ft 	 8.5" Orbit slimDrive BHA Lateral COMPLETED 10:43, May 04 2020 
 Drilling run 8.5 in 7600.00 - 10941.85 ft 	

4.17 Design Casing

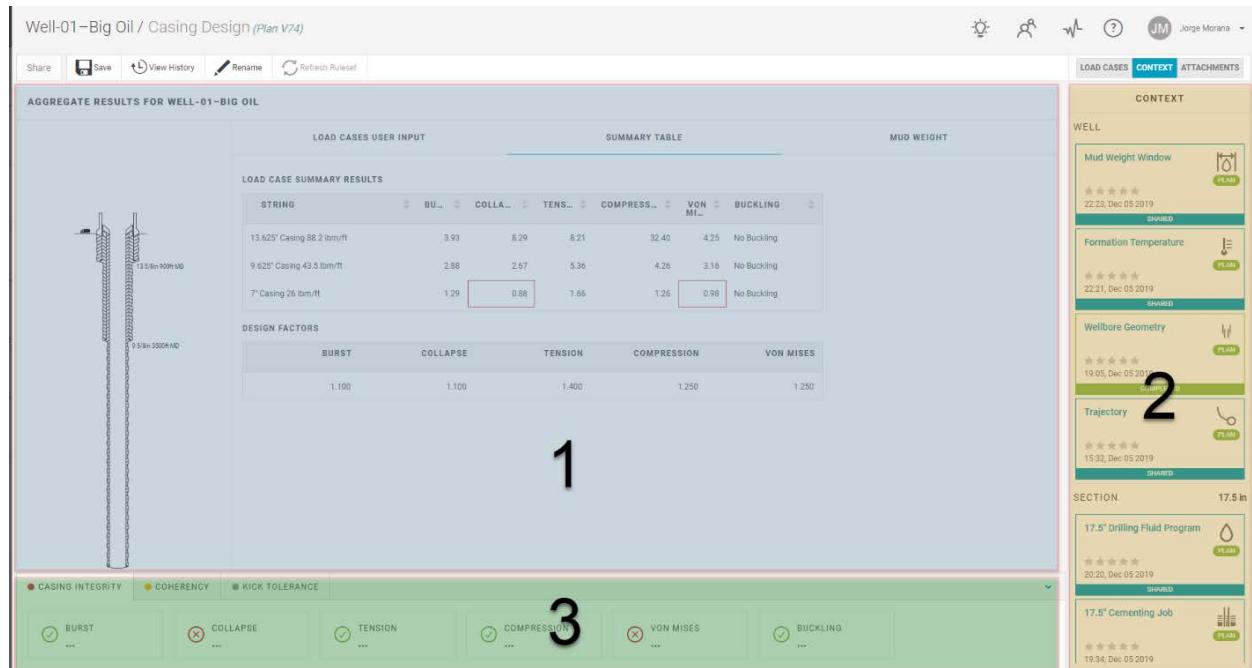
1. Go to the Plan page icon  . Then go to the Wellbore objects view select the “Create Casing Design” object.



2. Click on the plus sing icon and select “Casing Design” and also click on the Corporate ruleset, then click on “Create”.



Once created, the page will look like this:



The screenshot shows the DrillPlan Casing Design interface for Well-01-Big Oil. The main workspace (1) displays a wellbore schematic with three casing strings: 13 1/2" Casing 88.2 lbm/ft, 9 5/8" Casing 43.5 lbm/ft, and 7" Casing 26 lbm/ft. To the right is the Context panel (2), which includes sections for WELL, SECTION, and Trajectory, each listing various parameters with their last update dates. At the bottom is the Automated Engineering Analysis (AEA) pane (3), which shows summary results for five categories: BURST, COLLAPSE, TENSION, COMPRESSION, and VON MISES.

LOAD CASES	USER INPUT	SUMMARY TABLE	MUD WEIGHT			
LOAD CASE SUMMARY RESULTS						
STRING	BURST	COLLAPSE	TENS...	COMPRESS...	VON MISES	BUCKLING
13 1/2" Casing 88.2 lbm/ft	3.93	8.29	8.21	32.40	4.25	No Buckling
9 5/8" Casing 43.5 lbm/ft	2.88	2.67	5.36	4.26	3.16	No Buckling
7" Casing 26 lbm/ft	1.29	0.88	1.66	1.26	0.98	No Buckling

DESIGN FACTORS	BURST	COLLAPSE	TENSION	COMPRESSION	VON MISES
	1.100	1.100	1.400	1.250	1.250

The editor includes 3 main components:

1. The main work space area, where you can see the load cases, wellbore schematic and the parameters used for the analysis
2. The context panel on the right, as to run the tubular engine and to validate the casing design, you must provide the following data:
 - Pore pressure
 - Fracture pressure
 - Formation temperature
 - Wellbore geometry
 - Trajectory
 - Mud for all sections
3. The Automated Engineering Analysis (AEA) pane on the bottom that shows the summary results of the analysis

If the data is coherent, the tubular engine automatically runs with the load cases defined in the Corporate Settings.

4.17.1 Casing Design Analysis

For DrillPlan to run the tubular engine and to validate the casing design, the following data are required:

- Pore pressure
- Fracture pressure
- Formation temperature
- Wellbore geometry
- Trajectory
- Mud for all sections

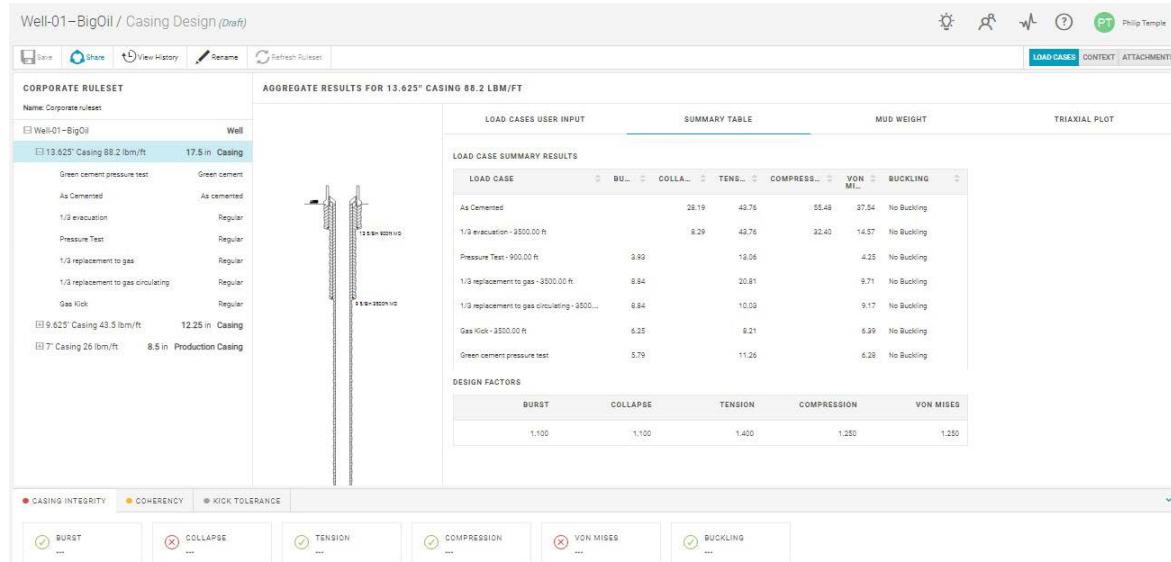
The data needs to be coherent for the tubular engine to automatically run. For instance, that the formation temperature is defined across the entire well trajectory and geometry.

4.17.2 Analysis results

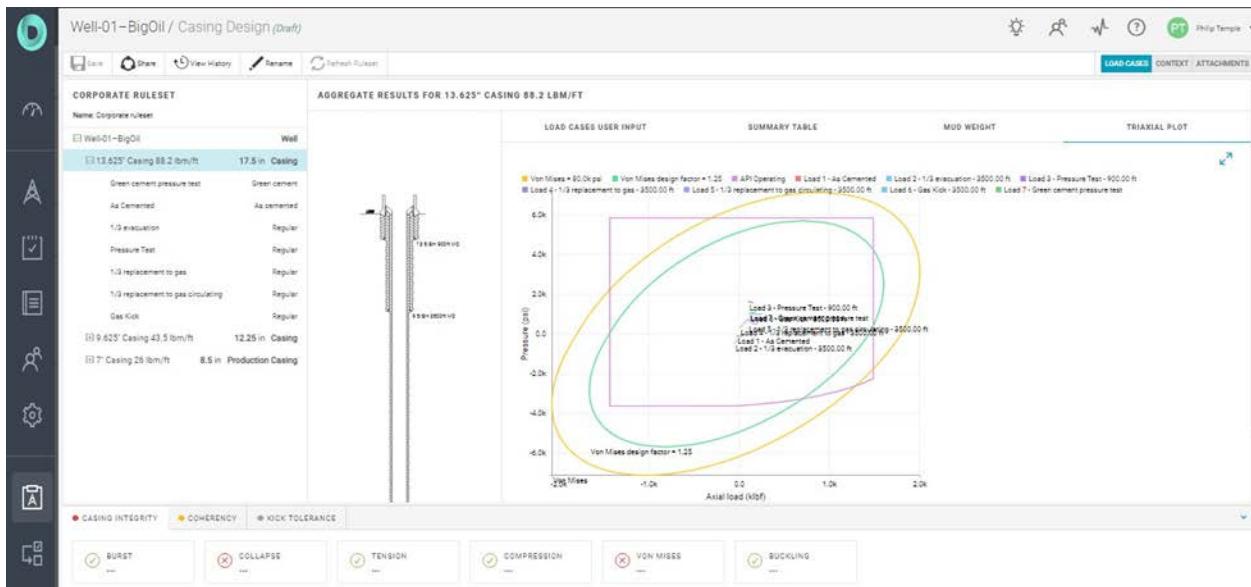
The results from the load cases will be given as a summary in the AEA pane in the lower section. The tubular engine will calculate all forces that apply on the casing for the various load cases (stress, axial force etc.) and use all available data from the contextual objects. In addition to the exposed data, the tubular engine use properties in the casing catalog that is not exposed (like yield stress and other material properties).

You can view the casing design results for the combined axial load analysis on the triaxial plot.

1. In the casing design editor, select the string that you want to view, for example the 13.625" Casing
2. Select the Summary Table tab



3. Now change to the Triaxial Plot tab



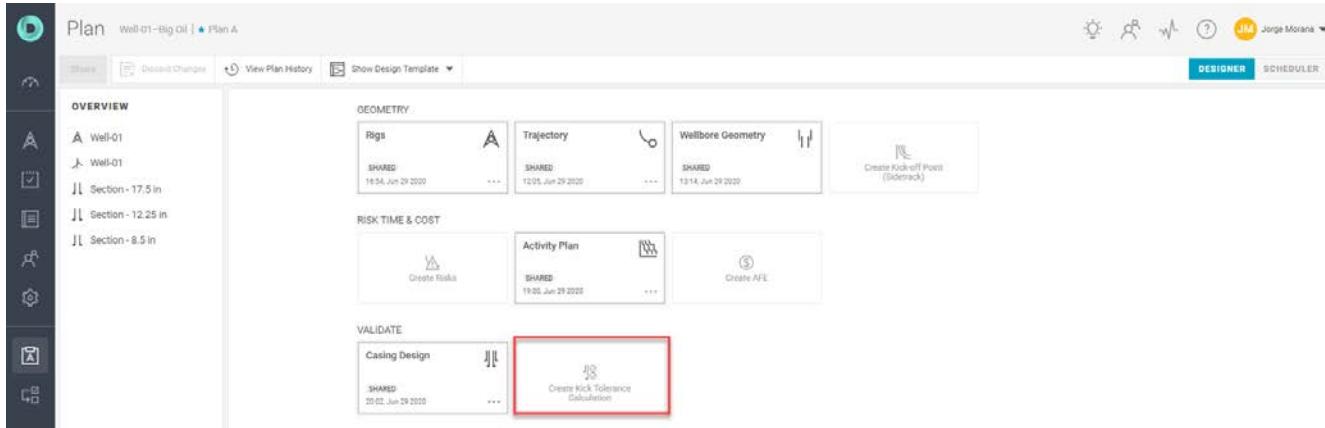
The applied load cases on the selected string appear on the triaxial plot. For tapered strings, there is one plot for each tapered section, starting from the top segment.

When done, Share, set to Complete and set progress bar accordingly.

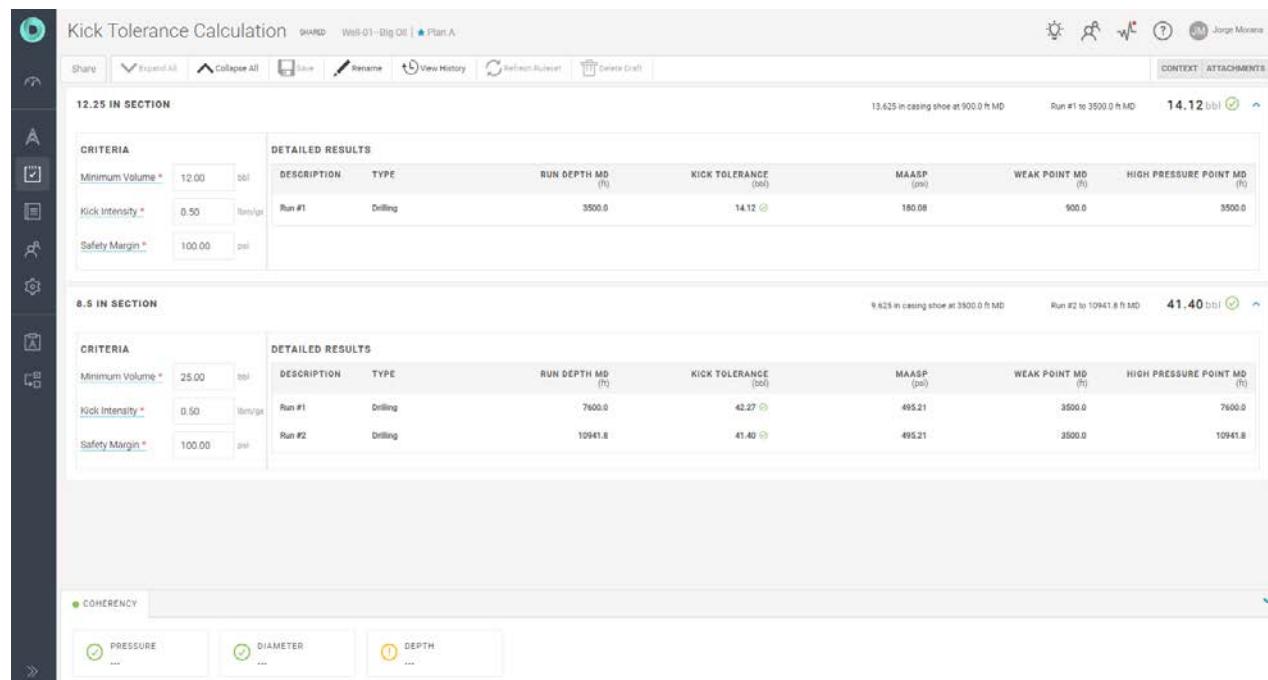
4.18 Kick Tolerance Calculation

In DrillPlan, you can calculate the kick tolerance for each relevant section in the wellbore geometry from the Calculate Kick Tolerance object editor page and validate against your defined criteria for kick volume and kick intensity. Kick tolerance is defined as the maximum allowable kick volume that can be shut in and circulated to the surface without fracturing the formation at the weakest point (usually the casing shoe). The kick tolerance calculation in DrillPlan follows the standard single bubble approach.

Go to plan view by clicking on  icon. Select the “Create Kick Tolerance Calculation” object, at the wellbore level, on the “VALIDATE” Tag.



Once it is created, Expand All to see the values.



12.25 IN SECTION

CRITERIA		DETAILED RESULTS				
DESCRIPTION	TYPE	RUN DEPTH MD (ft)	KICK TOLERANCE (psi)	MAASp (psi)	WEAK POINT MD (ft)	HIGH PRESSURE POINT MD (ft)
Minimum Volume *	12.00 bbl	3500.0	14.12	180.08	900.0	3500.0
Kick Intensity *	0.50 lbf/in²					
Safety Margin *	100.00 psi					

8.5 IN SECTION

CRITERIA		DETAILED RESULTS				
DESCRIPTION	TYPE	RUN DEPTH MD (ft)	KICK TOLERANCE (psi)	MAASp (psi)	WEAK POINT MD (ft)	HIGH PRESSURE POINT MD (ft)
Minimum Volume *	25.00 bbl	7600.0	42.27	495.21	3500.0	7600.0
Kick Intensity *	0.50 lbf/in²					
Safety Margin *	100.00 psi	10941.8	41.40	495.21	3500.0	10941.8

COHERENCY

PRESSURE ... DIAETER ... DEPTH ...

When done, remember to Share and set progress bar accordingly.

4.19 Automatic Engineering Analysis (AEA)

The AEA is the primary tool to analyze and validate designs. This content shows various engineering calculations such as Torque and Drag (T&D), Hydraulic, BHA Tendency, BHA dynamic, BHA Magnetic Interference, Trajectory Anti-Collision analysis, and so on. Each design editor has this tool on its page. The results are calculated automatically when there is a change in the design, or in the related data on the Context panel.

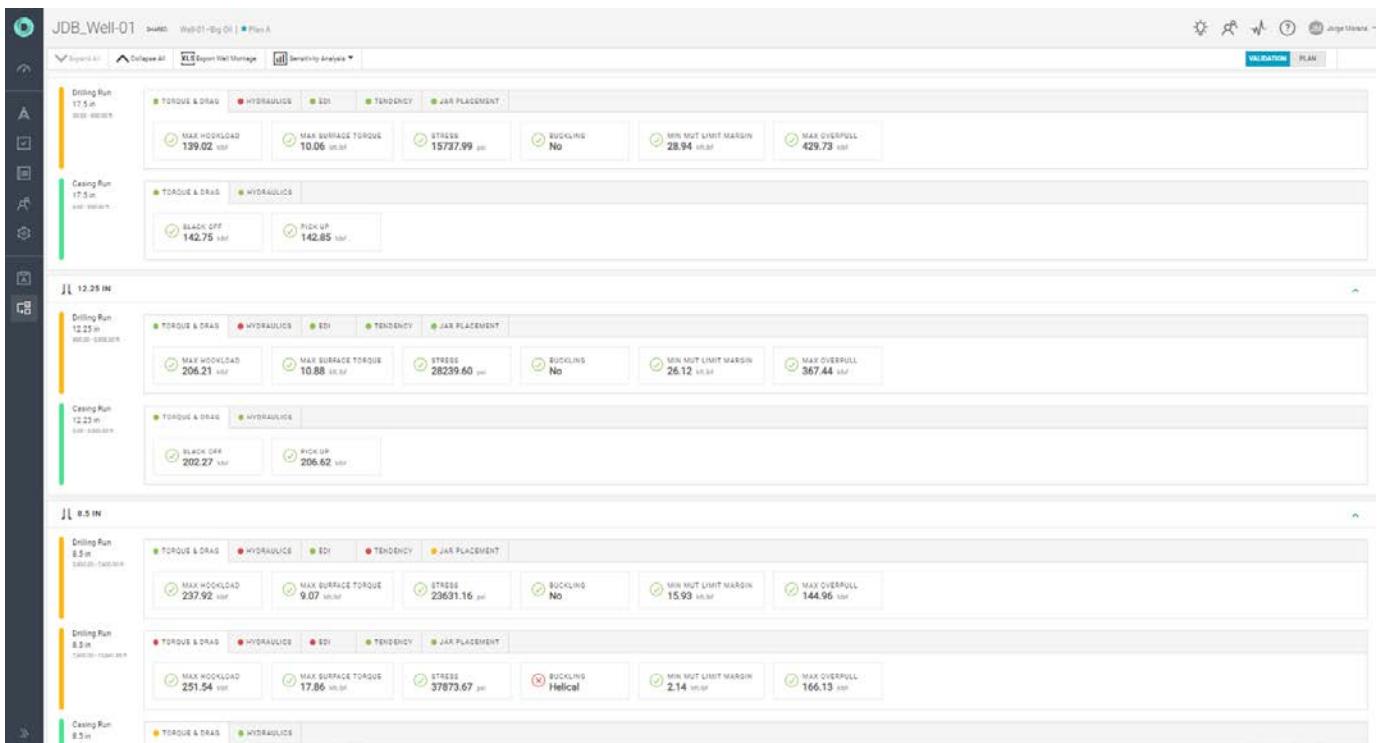
4.19.1 AEA Traffic lights

Traffic lights are used to indicate if the AEA result is safe for drilling.

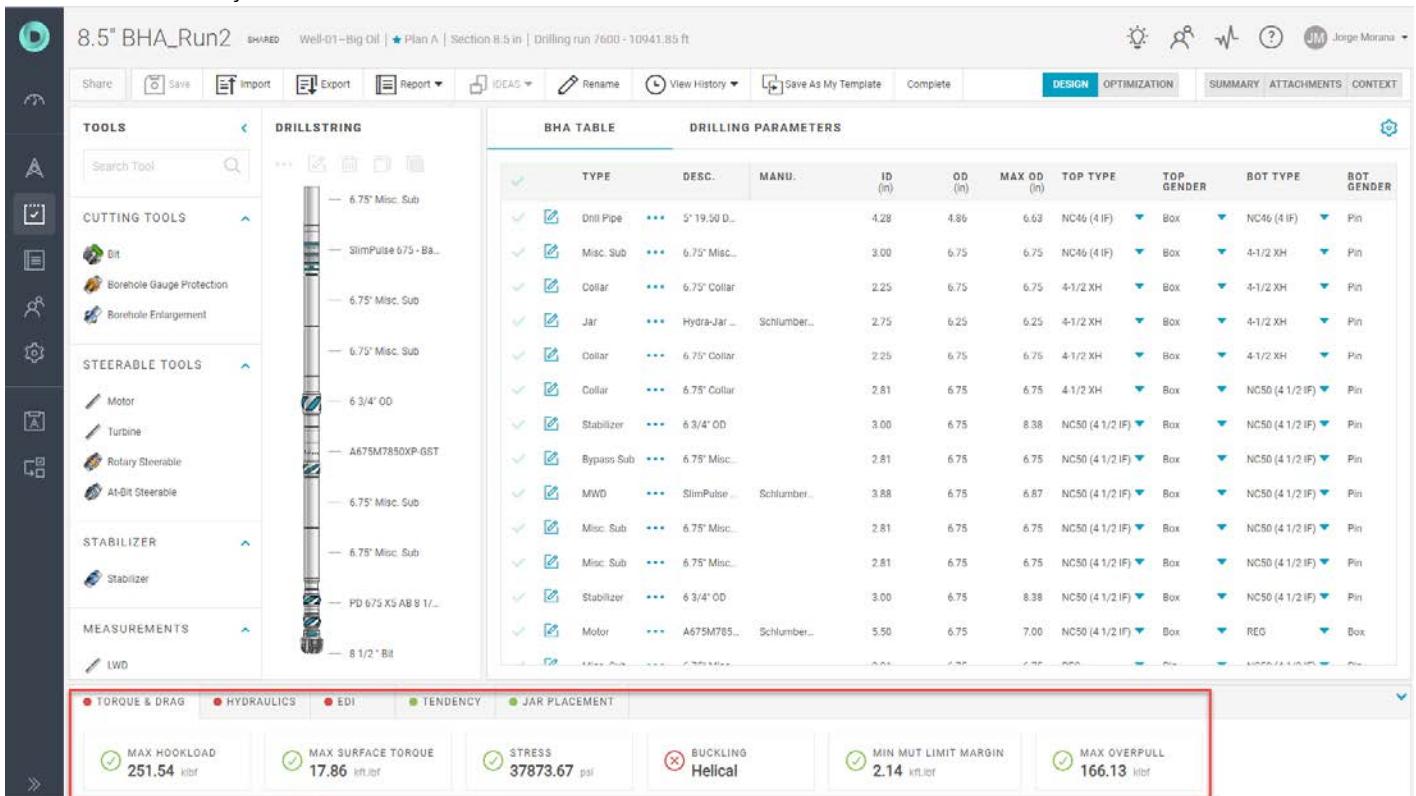
- ✓ The green light indicates that the result is within the safe zone
- ! The yellow light indicates that the result is within the warning zone. You might need to change your design to lower the drilling risk
- ✗ The red light indicates that the result is not safe, and the well plan should not be drilled. You must adjust the design or change the related contexts for the well to be drillable
- ? The question mark on the AEA card indicates that some related context object is not available.

The AEA is triggered at two different levels:

1. At the full project/well level:



2. At the object level:



BHA TABLE

		BHA TABLE		DRILLING PARAMETERS						
	Type	Desc.	Manu.	ID (in)	OD (in)	Max OD (in)	Top Type	Top Gender	Bot Type	Bot Gender
✓	Drill Pipe	*** 5" 19.50 D...		4.28	4.86	6.63	NC46 (4 IF)	Box	NC46 (4 IF)	Pin
✓	Misc. Sub	*** 6.75" Misc...		3.00	6.75	6.75	NC46 (4 IF)	Box	4-1/2 XH	Pin
✓	Collar	*** 6.75" Collar		2.25	6.75	6.75	4-1/2 XH	Box	4-1/2 XH	Pin
✓	Jar	*** Hydra-Jar...	Schlumber...	2.75	6.25	6.25	4-1/2 XH	Box	4-1/2 XH	Pin
✓	Collar	*** 6.75" Collar		2.25	6.75	6.75	4-1/2 XH	Box	4-1/2 XH	Pin
✓	Collar	*** 6.75" Collar		2.81	6.75	6.75	4-1/2 XH	Box	NC50 (4 1/2 IF)	Pin
✓	Stabilizer	*** 6 3/4" OD		3.00	6.75	8.38	NC50 (4 1/2 IF)	Box	NC50 (4 1/2 IF)	Pin
✓	Bypass Sub	*** 6.75" Misc...		2.81	6.75	6.75	NC50 (4 1/2 IF)	Box	NC50 (4 1/2 IF)	Pin
✓	MWD	*** SlimPulse...	Schlumber...	3.88	6.75	6.87	NC50 (4 1/2 IF)	Box	NC50 (4 1/2 IF)	Pin
✓	Misc. Sub	*** 6.75" Misc...		2.81	6.75	6.75	NC50 (4 1/2 IF)	Box	NC50 (4 1/2 IF)	Pin
✓	Misc. Sub	*** 6.75" Misc...		2.81	6.75	6.75	NC50 (4 1/2 IF)	Box	NC50 (4 1/2 IF)	Pin
✓	Stabilizer	*** 6 3/4" OD		3.00	6.75	8.38	NC50 (4 1/2 IF)	Box	NC50 (4 1/2 IF)	Pin
✓	Motor	*** A675M785...	Schlumber...	5.50	6.75	7.00	NC50 (4 1/2 IF)	Box	REG	Box

TORQUE & DRAG **HYDRAULICS** **EDI** **TENDENCY** **JAR PLACEMENT**

MAX HOOKLOAD **251.54 kN**

MAX SURFACE TORQUE **17.86 kNm**

STRESS **37873.67 psi**

BUCKLING **Helical**

MIN MUD LIMIT MARGIN **2.14 kN/m**

MAX OVERPULL **166.13 kN**

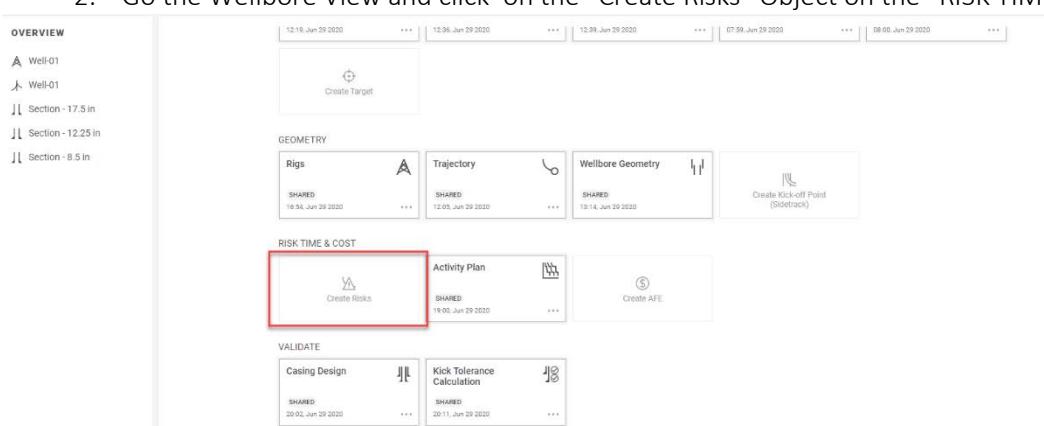
4.20 Offset Well Analysis and Engineering

4.20.1 Risks

The aim of the Risks object in DrillPlan is to provide users with an effective way to access legacy data necessary to identify potential risks during the well planning process. The analysis is done based on selected offset wells. This training will use a set of preloaded data, but typically this data will come from daily drilling reports, manual data entry or import from WITSML risk files.

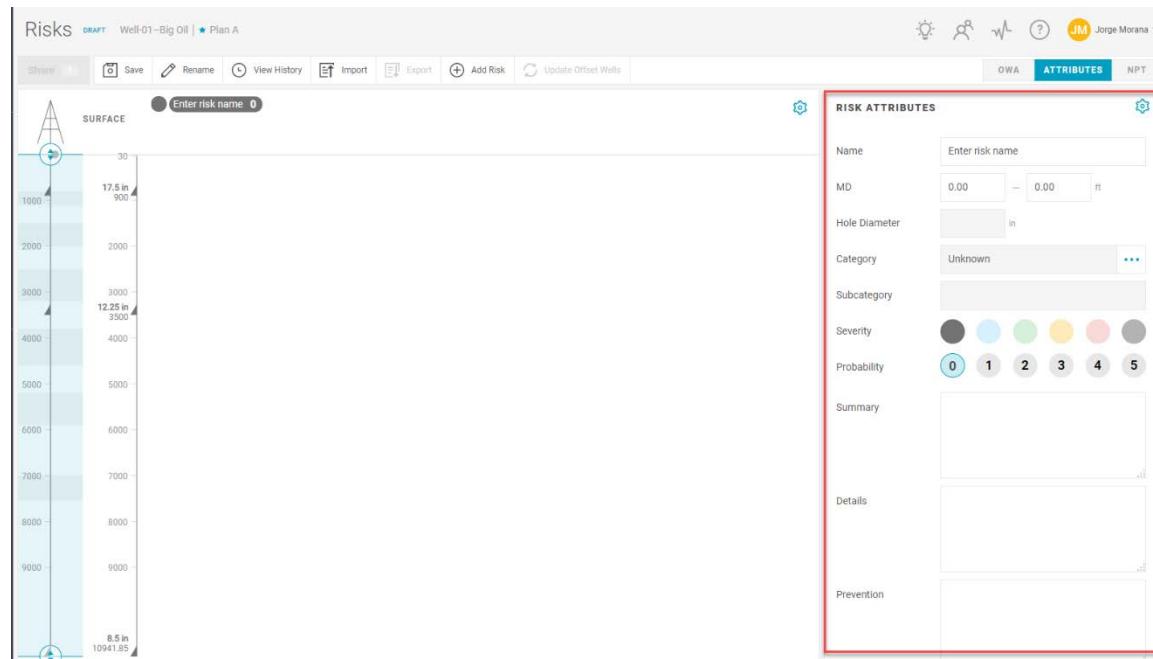
4.20.1.1 Adding risks manually

1. Go to the Plan page icon 
2. Go the Wellbore View and click on the “Create Risks” Object on the “RISK TIME & COST” tag



The screenshot shows the DrillPlan software interface. On the left, there's a sidebar with sections like 'OVERVIEW', 'GEOMETRY', and 'RISK TIME & COST'. The 'RISK TIME & COST' section contains several buttons: 'Create Risks' (which is highlighted with a red box), 'Activity Plan', and 'Create AFE'. Below this section, there are buttons for 'Casing Design' and 'Kick Tolerance Calculation'. At the top of the screen, there's a navigation bar with icons and a search bar.

3. On the top bar, click on Add Risk  (or in the central section, click on Create), the Risk Attributes form displays:

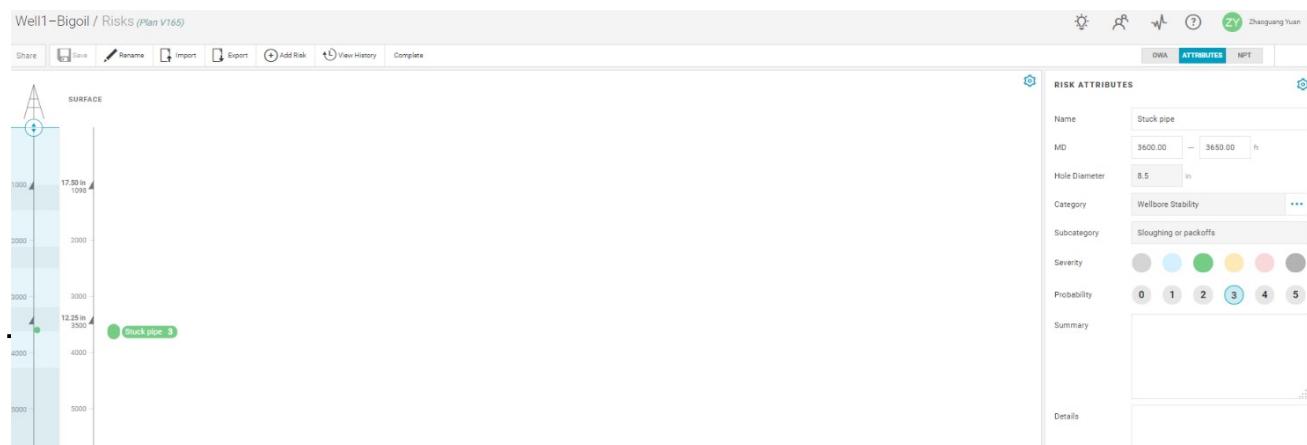


- On the Risk Attributes form input the following data:

In the Settings (top right corner)	User in NPT: Checked Set as retired: Not checked
Name	Stuck pipe
MD	3600 – 3650 ft
Hole diameter	8.5" (this value comes automatically)
Category	Wellbore Stability
Sub Category	Sloughing or packoffs
Severity	Serious [green]
Probability	Medium [3]

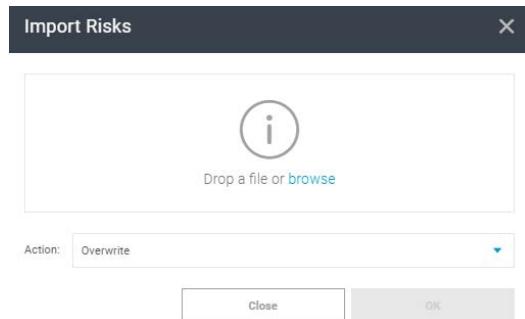
- After entering the data click on Save  and Share  to make the risk available to the team

Additional risks can be manually added by repeating the process described above.



4.20.1.2 Importing risks from a WITSML risk file

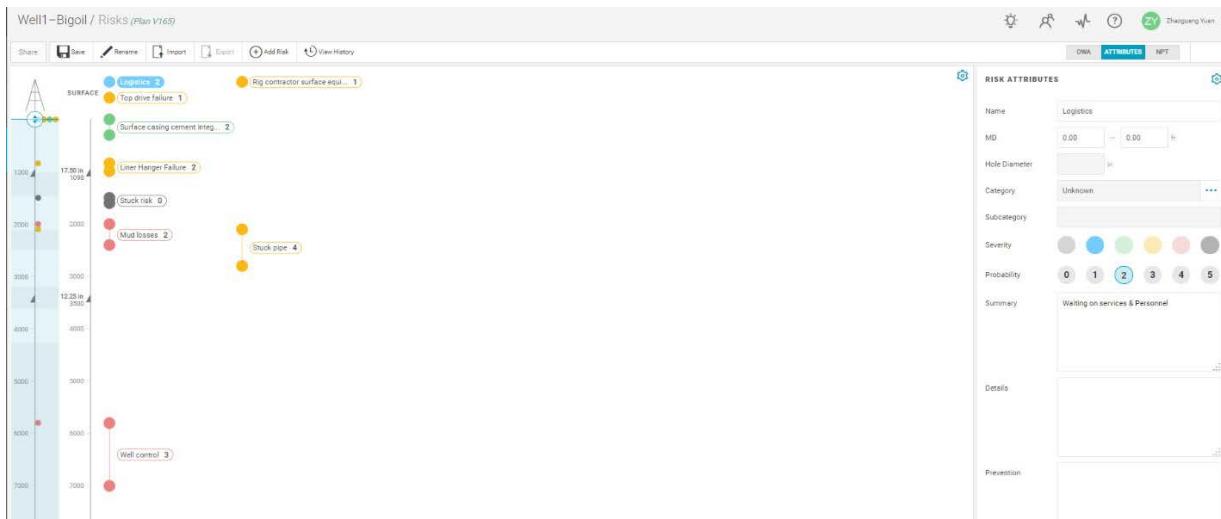
6. On the Risks window select Import  , The Import Risks window appears:



7. Browse for the file **Demo - Risks.xml** and select the action to Overwrite. Then select OK

Note: Depending on your needs, you can change the action to Append.

8. The risks will be imported into DrillPlan:



4.20.2 Offset Well Analysis

1. Remain in the same page and switch the view to OWA, by clicking on

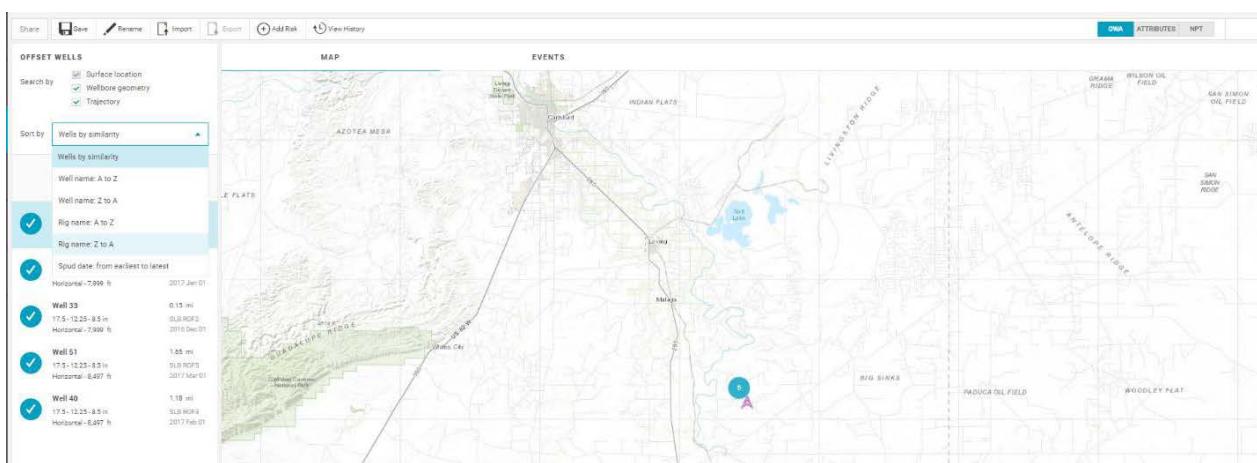


in the right upper corner of the page

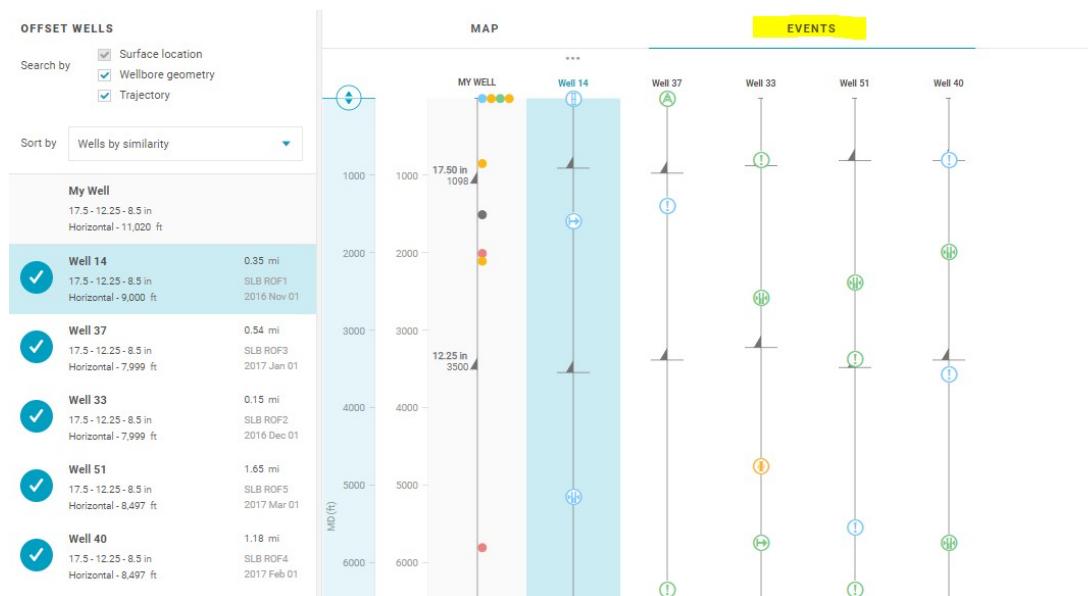
The Offset Well Analysis (OWA) functionality in the Risks pane is designed to visualize events from offset wells and let well planners decide what events can be promoted as risks in the subject well. Offset wells can be searched based on:

- Surface location; Wellbore geometry; Trajectory

Offset wells can be sorted by well description such as well name or rig name etc.

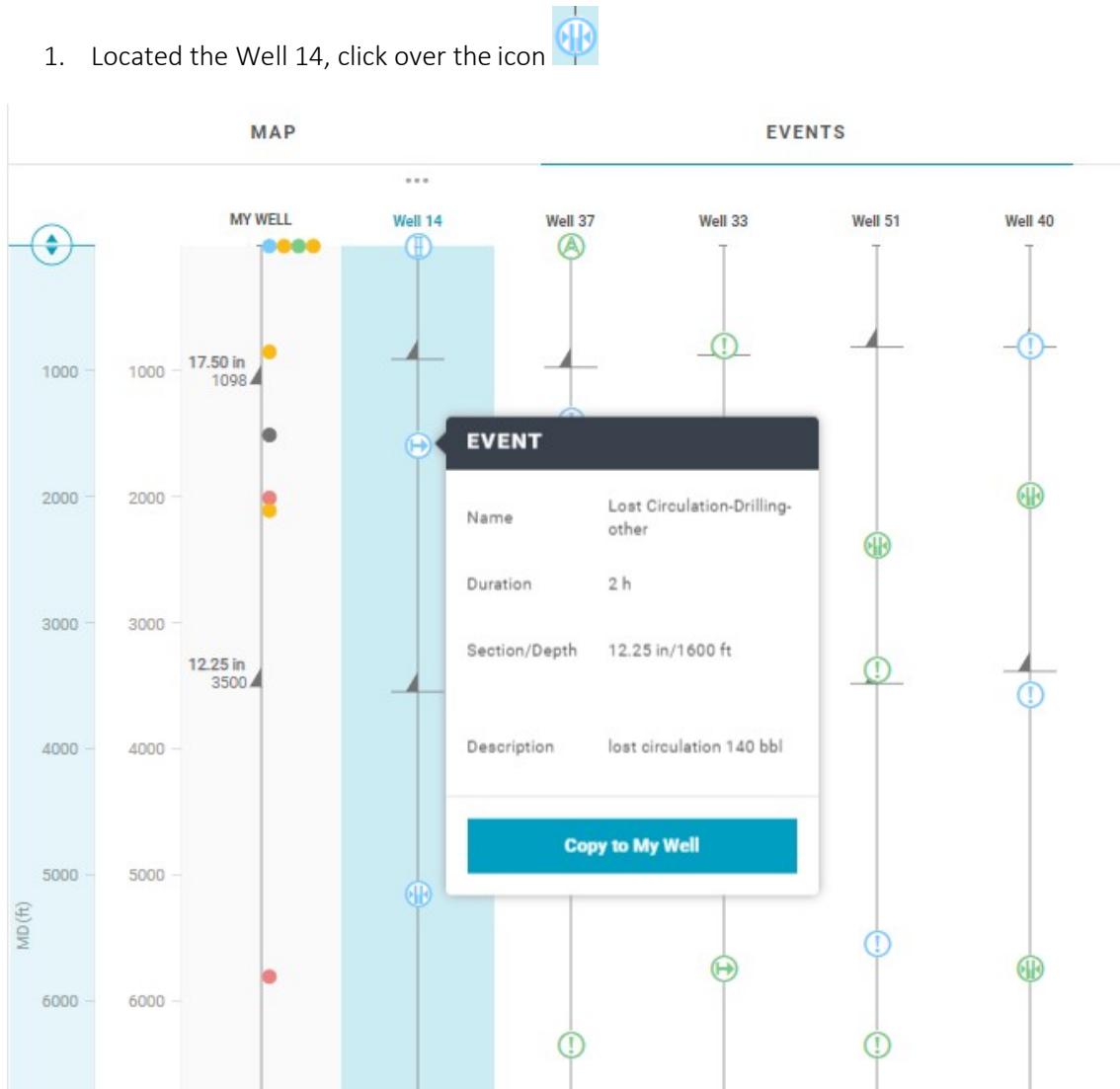


2. Click on the EVENTS tab to change the view again,



4.20.2.1 Copy a risk from offset well

Users can create a risk on the subject well from an event that occurred in an offset well. Click the event symbol on the offset well on the chart. The event detail card appears, then click Copy to My Well to have the risk copied into your new well. You will see this now copied to your well.



1. Located the Well 14, click over the icon

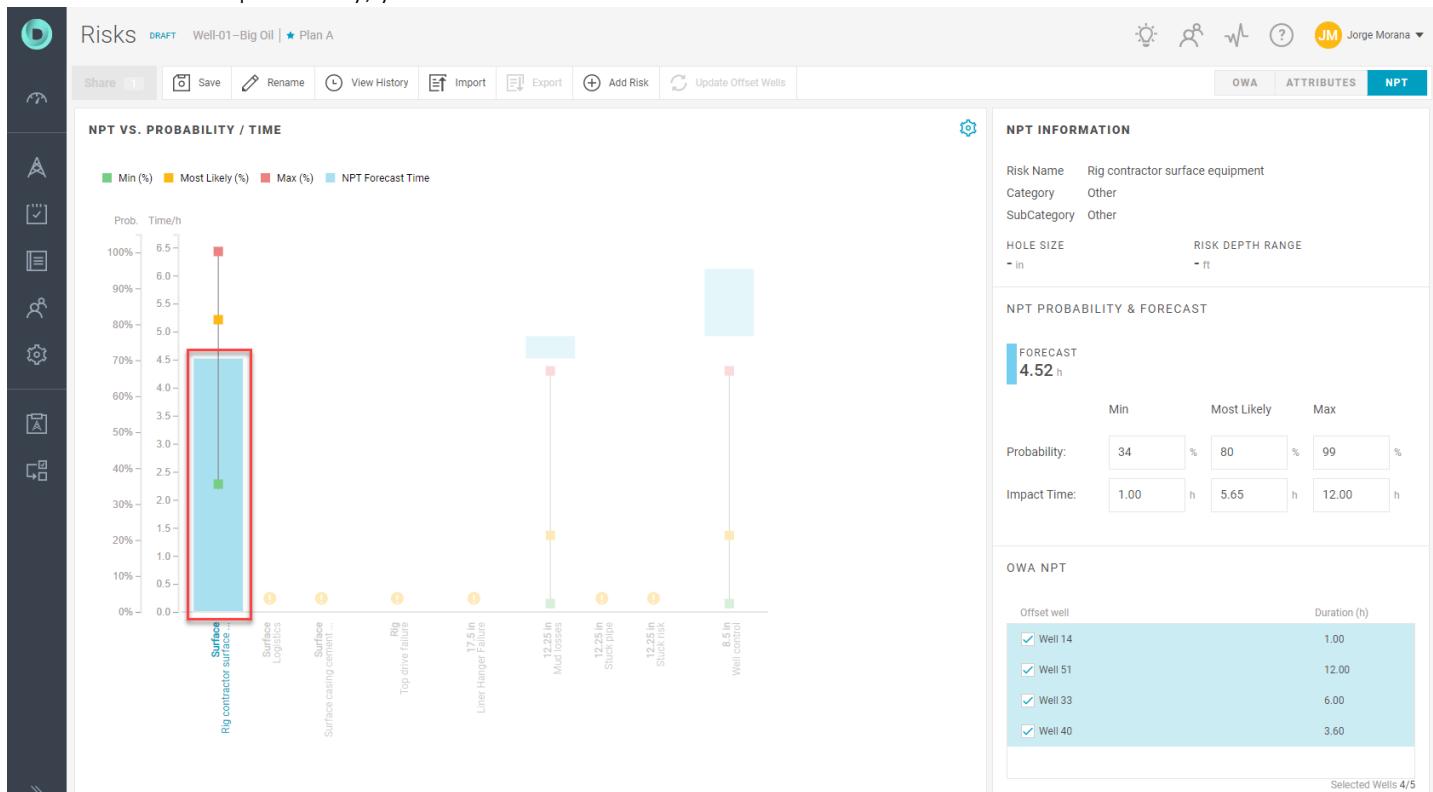
2. Click on the Copy to my Well option



4.20.2.2 Non-Productive Time

To view the details of a risk NPT, click the column on the NPT chart. The NPT Information section appears on the right side of the chart.

- NPT Probability & Forecast section:** By default, the NPT forecast is based on the Most Likely values of impact time and probability of the offset well events. The Min and Max values give you the low and high estimation. You can also input the impact time and probability in the input boxes. The OWA impact time and probability are listed for your reference
- OWA NPT section:** The offset wells selected in the OWA view of the Risks page are listed as reference wells for NPT calculation. If you want to exclude some offset wells in the calculation of OWA impact time and probability, you can clear the selection of these wells in this area



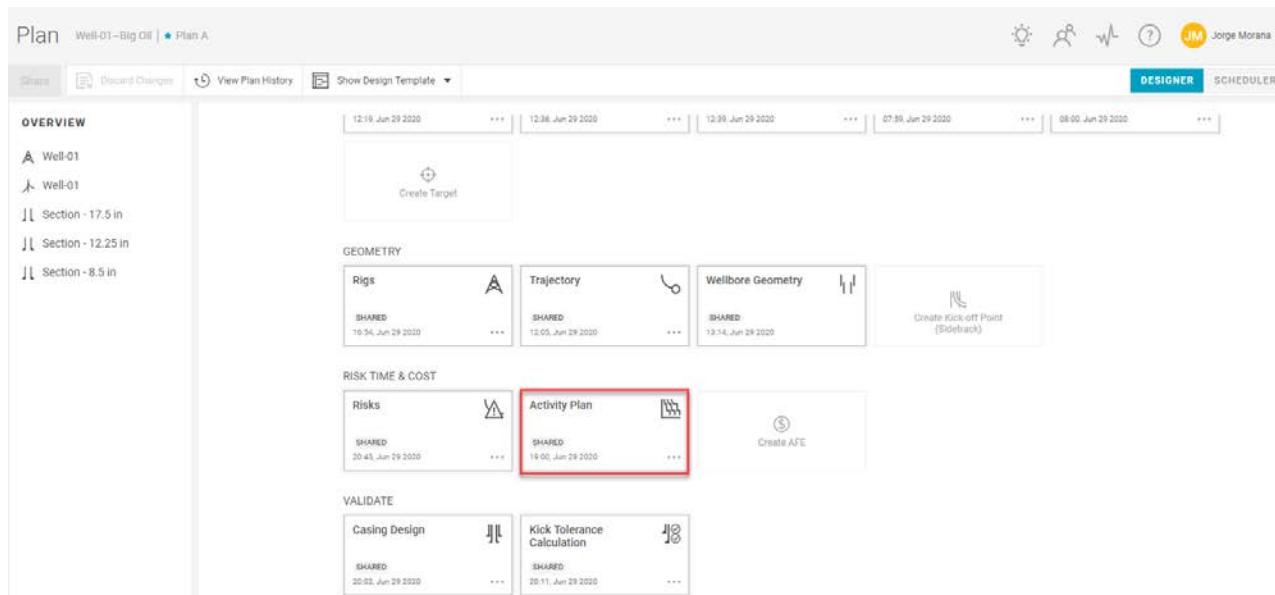
When done, **share** to the team.

4.21 Activity Time Estimation

The DrillPlan Activity Plan feature can automatically generate a detailed operation activity plan based on offset wells data and the latest shared project data. The Activity Plan includes the associated time for each activity. DrillPlan provides a predefined activity template. You can also analyze the offset well activities and use them as reference for your project estimation. Based on the activity plan, you create an AFE to estimate the cost using the AFE object.

We already created the Activity Plan, in case you did not have it, please

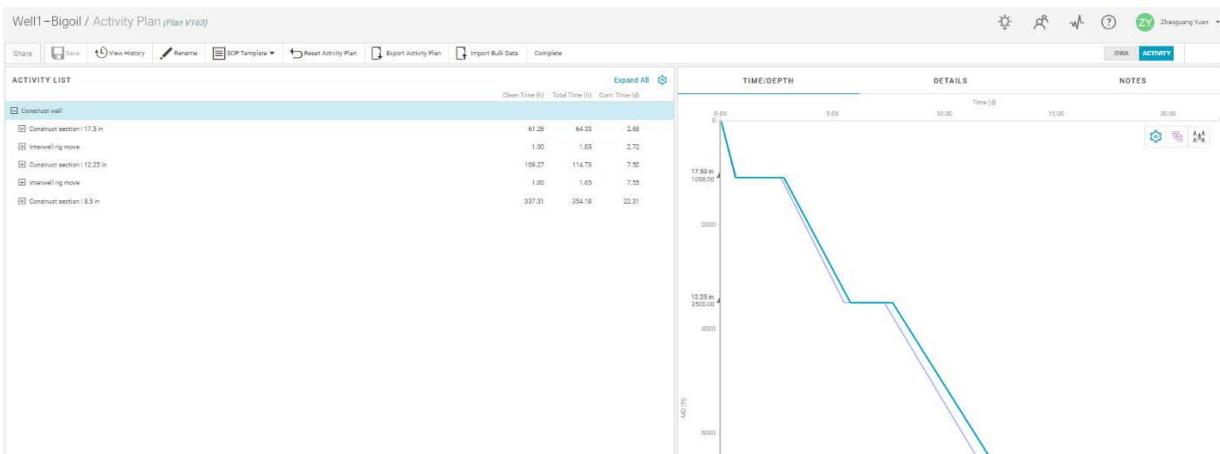
1. Go to the Plan page  icon view
2. Go the Wellbore View and click on the “Activity Plan” object



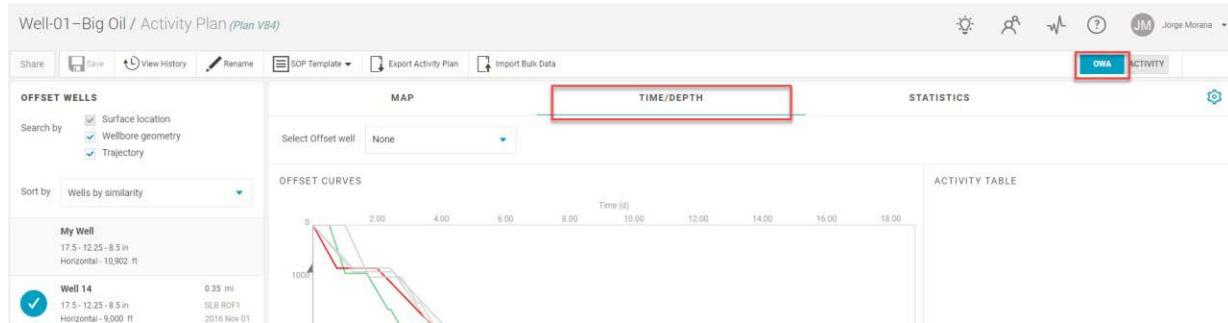
The screenshot shows the DrillPlan Plan page for Well1-BigOil | Plan A. The top navigation bar includes 'Plan' (selected), 'Well1-BigOil', 'Plan A', 'Designer' (selected), and 'Scheduler'. The main area is divided into several sections:

- OVERVIEW:** Shows a summary of the well sections: Well-01, Well-01, Section - 17.5 in, Section - 12.25 in, and Section - 8.5 in. It includes a 'Create Target' button.
- GEOMETRY:** Contains four cards: 'Rigs' (SHARED, 16:54, Jun 29 2020), 'Trajectory' (SHARED, 12:05, Jun 29 2020), 'Wellbore Geometry' (SHARED, 12:14, Jun 29 2020), and 'Create Kick-off Point (Bidletrack)'.
- RISK TIME & COST:** Contains three cards: 'Risks' (SHARED, 20:43, Jun 29 2020), 'Activity Plan' (SHARED, 14:00, Jun 29 2020, highlighted with a red box), and 'Create AFE'.
- VALIDATE:** Contains two cards: 'Casing Design' (SHARED, 20:03, Jun 29 2020) and 'Kick Tolerance Calculation' (SHARED, 20:11, Jun 29 2020).

The Activity Plan scheduler view will be shown

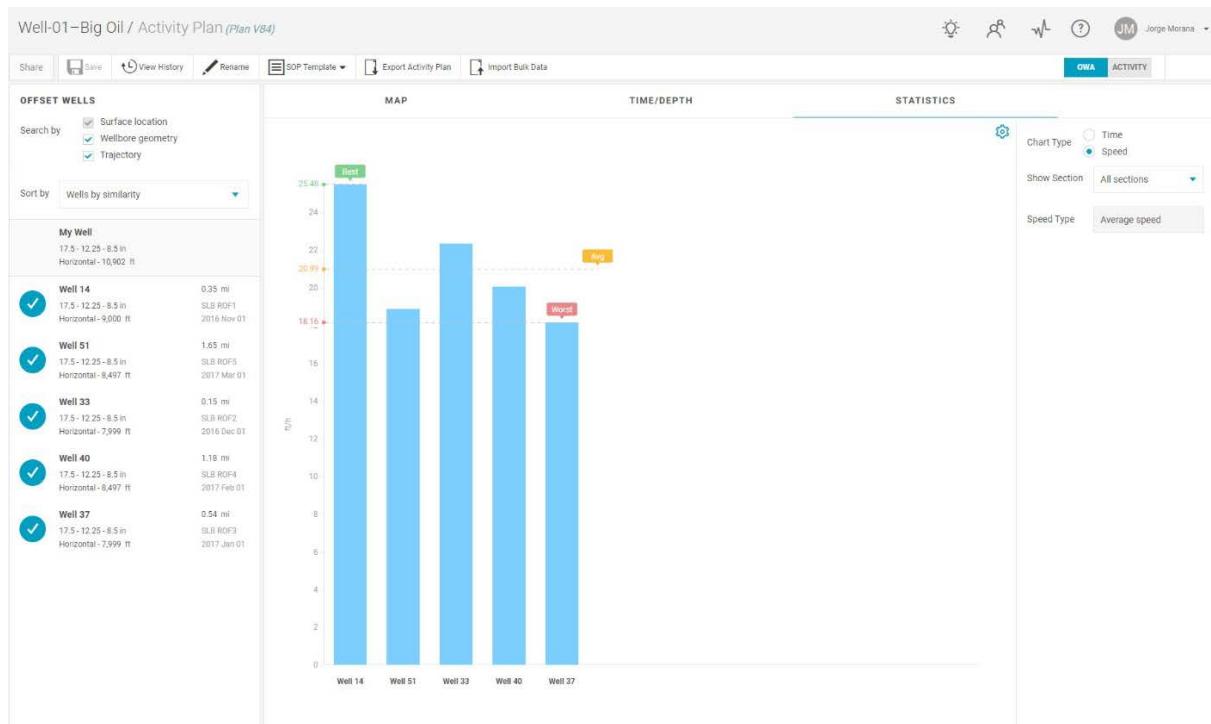


3. Switch to the OWA tab and the time/depth section to review the offset wells and the events found in each of them

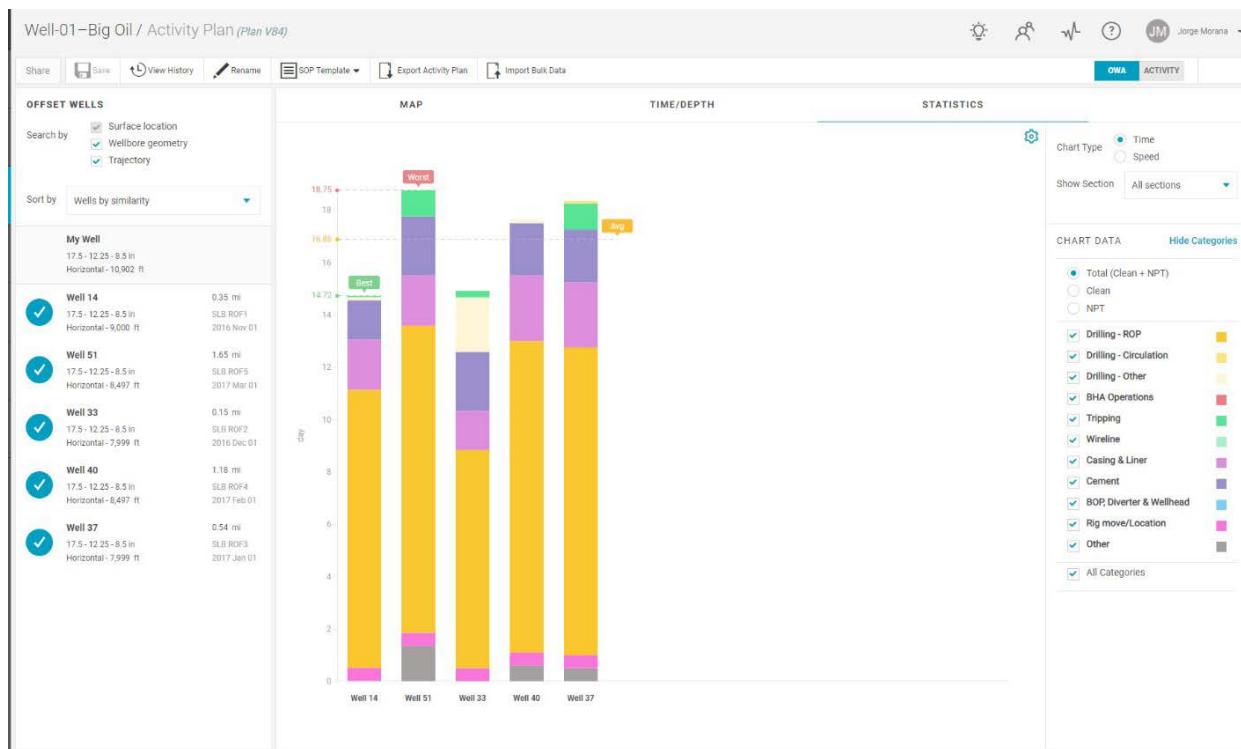


In the OWA view, you can filter your searched offset wells. Here you can view the statistics of the offset well activities on the Statistics tab. There are two types of statistics chart:

- Speed: Shows the average drilling speed of each offset well.
You can select to show the speed for all sections, or for an individual section



4. Select Chart type "Time", then click Show Categories, and select or clear the check boxes for each category



To view more detailed time values, point to an activity on the chart.

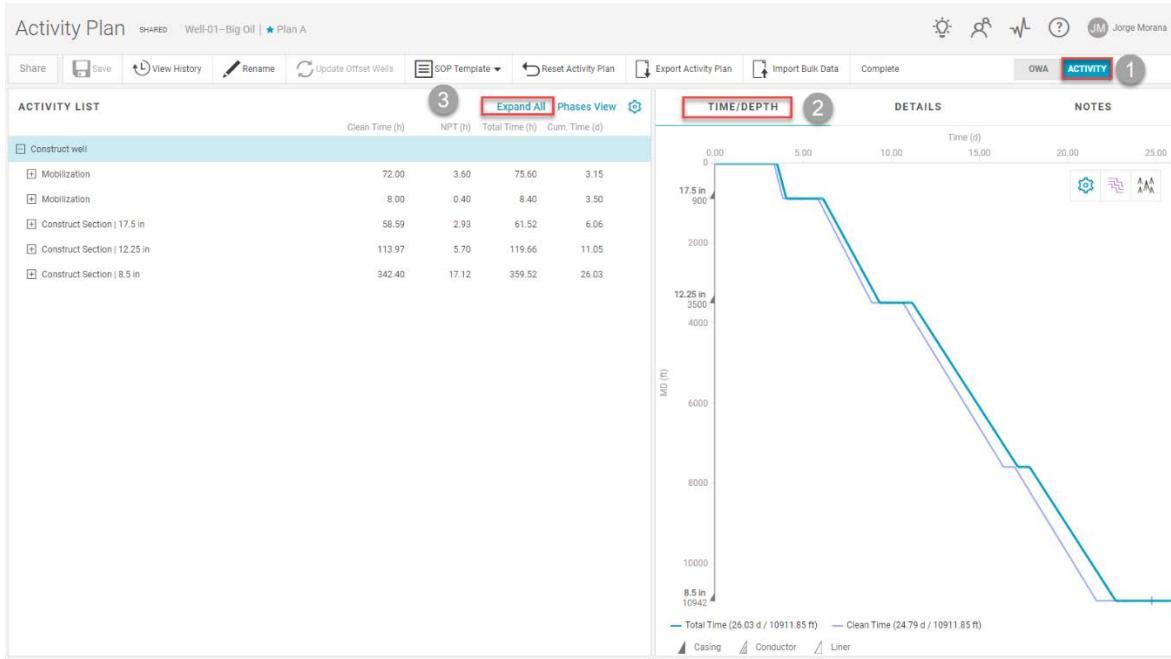
Select the settings button on the top right corner to:

Sort By: Select to sort wells by distance, well names, rig names, and spud date

Stick Type: Select to show the chart sticks in hours or percentages

Show Key Value: Select or clear the check box to show or hide key values, such as best, worst, and average

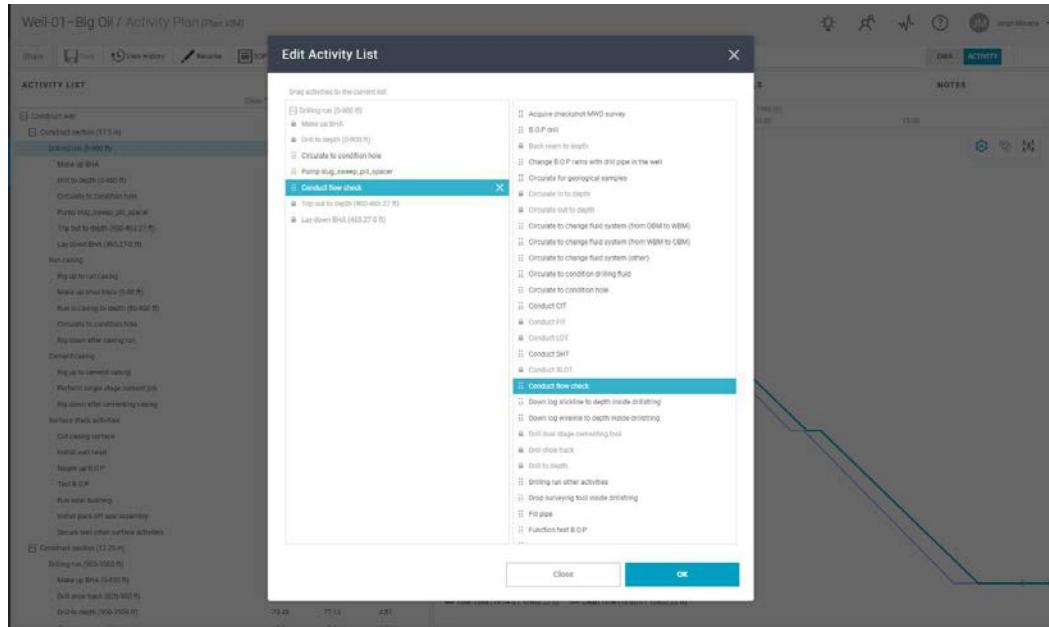
5. Back to the exercise, (1) switch to the Activity tab and (2) you will see your well Time vs. Depth curves (total time and clean time), (3) expand the Activity List on the left side as shown below



The Activity List opens with the default template based on onshore activities. You can edit the Activity List, however, the ability to save the Activity List as a template and apply to other wells will be available within the next development cycles. The current workaround is to make changes and use the Copy basis of design function (which you can find in the Project Settings).

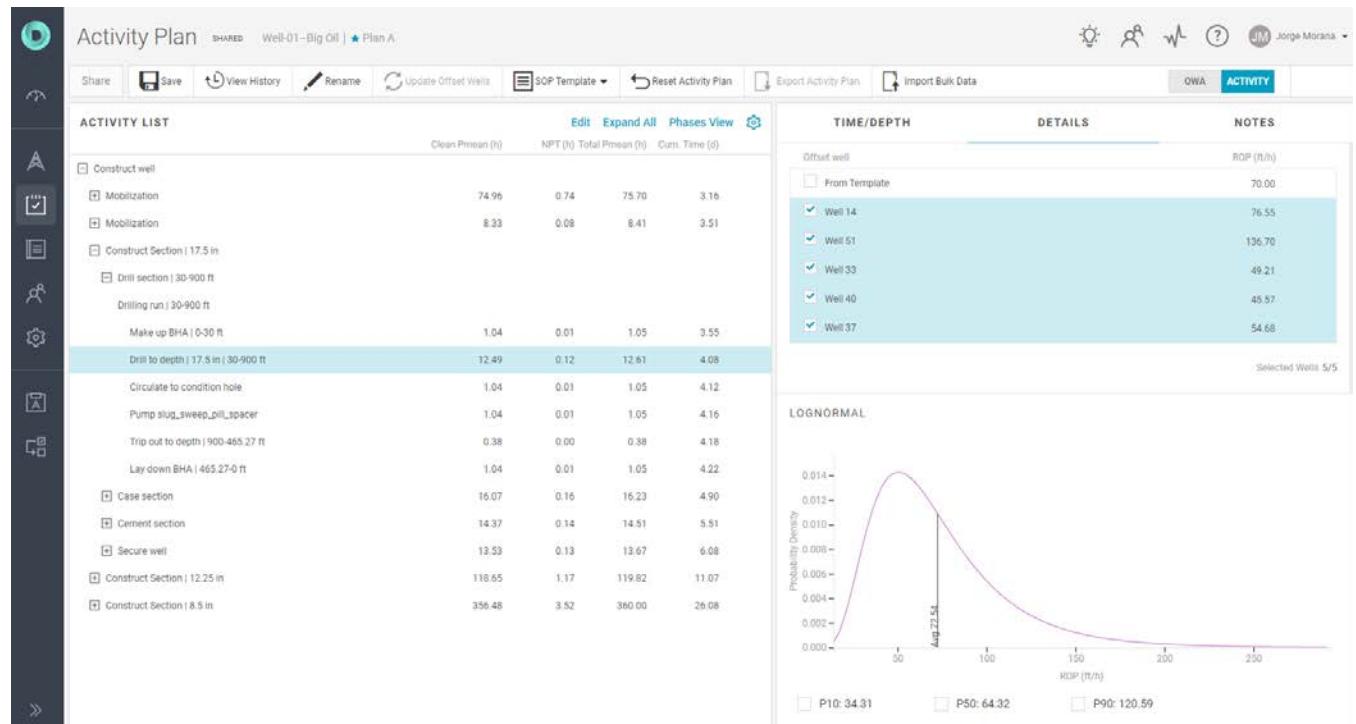
To edit the Activity List, select an activity from the expanded list and select edit. Drag and drop the activities from the right hand column into the left hand column. Notice that you can only edit per activity chapter.

6. Try now to edit activity chapter drilling run, then change and edit drilling chapter by adding a Function test BOP (you can drag and drop from the pop-up menu, from right to left panes) and then select OK



7. Now click on an individual activity, such as Drill to depth. Notice that under the details tab, the ROP speed has been estimated from off set wells with the same activity.

Pay attention to the comment on the right side: Probability distribution not defined. To change it, select the settings option and change the calculation method to Probabilistic.



The screenshot shows the DrillPlan software interface. On the left is a sidebar with icons for Share, Save, View History, Rename, Update Offset Wells, SOP Template, Reset Activity Plan, Export Activity Plan, Import Bulk Data, OWA, and ACTIVITY (which is selected). The main area has tabs for ACTIVITY LIST and DETAILS. The ACTIVITY LIST table includes columns for Activity Name, Clean Pmean (h), NPT (h), Total Pmean (h), and Cum. Time (d). The DETAILS section shows a list of offset wells used for estimation, with Well 14 selected. A probability distribution graph for 'Drill to depth | 17.5 in' is shown, with the x-axis labeled 'ROP (ft/h)' ranging from 50 to 250 and the y-axis labeled 'Probability Density' ranging from 0.000 to 0.014. The graph is bell-shaped, centered around 75 ft/h. Statistical values P10, P50, and P90 are displayed at the bottom of the graph.

ACTIVITY LIST	Clean Pmean (h)	NPT (h)	Total Pmean (h)	Cum. Time (d)
Construct well				
Mobilization	74.96	0.74	75.70	3.16
Mobilization	8.33	0.08	8.41	3.51
Construct Section 17.5 in				
Drill section 30-900 ft				
Drilling run 30-900 ft				
Make up BHA 0-30 ft	1.04	0.01	1.05	3.55
Drill to depth 17.5 in 30-900 ft	12.49	0.12	12.61	4.08
Circulate to condition hole	1.04	0.01	1.05	4.12
Pump slug_sweep_pill_spacer	1.04	0.01	1.05	4.16
Trip out to depth 900-465.27 ft	0.38	0.00	0.38	4.18
Lay down BHA 465-0 ft	1.04	0.01	1.05	4.22
Case section	16.07	0.16	16.23	4.90
Cement section	14.37	0.14	14.51	5.51
Secure well	13.53	0.13	13.67	6.08
Construct Section 12.25 in	116.65	1.17	119.82	11.07
Construct Section 8.5 in	356.48	3.52	360.00	26.08

Notice however that a “From Template” option exists. The template ROP FT/h is set at 70. Click on other activities and notice that many activities are without offset well data and rely solely on the from template time.

Activity Plan SHARED Well-01-Big Oil Plan A

Share Save View History Rename Update Offset Wells SOP Template Reset Activity Plan Export Activity Plan Import Bulk Data OWA ACTIVITY

ACTIVITY LIST					Edit	Expand All	Phases View	TIME/DEPTH	DETAILS	NOTES
	Clean Pmean (h)	NPT (h)	Total Pmean (h)	Cum. Time (d)						
<input type="checkbox"/> Construct well								Offset well		ROP (ft/h)
<input type="checkbox"/> Mobilization	74.96	0.74	75.70	3.16	<input checked="" type="checkbox"/> From Template			Well 14	70.00	
<input type="checkbox"/> Mobilization	8.33	0.08	8.41	3.51	<input checked="" type="checkbox"/> Well 51			Well 51	43.39	
<input type="checkbox"/> Construct Section 17.5 in					<input checked="" type="checkbox"/> Well 33			Well 33	25.21	
<input type="checkbox"/> Drill section 30-900 ft	17.03	0.17	17.20	4.22	<input checked="" type="checkbox"/> Well 40			Well 40	39.92	
<input type="checkbox"/> Case section	16.07	0.16	16.23	4.90	<input checked="" type="checkbox"/> Well 37			Well 37	27.34	
<input type="checkbox"/> Cement section	14.37	0.14	14.51	5.51					41.01	
<input type="checkbox"/> Secure well	13.53	0.13	13.67	6.08						Selected Wells: 5/5
<input type="checkbox"/> Construct Section 12.25 in										
<input type="checkbox"/> Drill section 900-3500 ft										
Drilling run 900-3500 ft										
Make up BHA 0-860 ft	1.04	0.01	1.05	6.12						
Drill shoe track 860-900 ft	1.04	0.01	1.05	6.16						
Drill to depth 12.25 in 900-3500 ft	76.48	0.75	77.24	9.38						
Circulate to condition hole	1.04	0.01	1.05	9.43						
Pump slug, sweep, pill, spacer	1.04	0.01	1.05	9.47						
Trip out to depth 3500-349.9 ft	2.21	0.02	2.23	9.57						
Lay down BHA 949.9-0 ft	1.04	0.01	1.05	9.61						
Case section	16.01	0.16	16.17	10.28						
Cement section	14.58	0.14	14.72	10.90						
Secure well	4.16	0.04	4.21	11.07						

Probability Density

Normal Distribution Plot: ROP (ft/h) vs. Probability Density

Mean: 35.39

P10: 24.62, P50: 35.39, P90: 46.16

Click on the notes tab and notice that no notes or procedures are present. Where do we add standard notes and procedures per activity, so as they always appear with the activity by default?

8. Head to Corporate Settings Standard Operating Procedures tab (Standard Operating Procedures)

In there, select the Drill to Depth activity. Notice that the ROP is 70 ft/hr., the same as what we saw in our activity planner. Change it here to 60 ft/hr. and add an attachment and some notes then, Save the SOP.

9. Head back to the Activity Plan of the well and add the SOP template just created to the project

10.

Activity Plan SHARED Well-01-Big Oil Plan A

Share Save View History Rename Update Offset Wells SOP Template Reset Activity Plan Export Activity Plan Import Bulk Data OWA ACTIVITY

ACTIVITY LIST					Edit	Expand All	Phases View	TIME/DEPTH	DETAILS	NOTES
	Clean Pmean (h)	NPT (h)	Total Pmean (h)	Cum. Time (d)						
<input type="checkbox"/> Construct well								Offset well		ROP (ft/h)
<input type="checkbox"/> Mobilization	74.96	0.74	75.70	3.16	<input checked="" type="checkbox"/> From Template			Well 14	70.00	
<input type="checkbox"/> Mobilization	8.33	0.08	8.41	3.51	<input checked="" type="checkbox"/> Well 51			Well 51	76.55	
<input type="checkbox"/> Construct Section 17.5 in					<input checked="" type="checkbox"/> Well 33			Well 33	136.70	
<input type="checkbox"/> Drill section 30-900 ft					<input checked="" type="checkbox"/> Well 40			Well 40	49.21	
Drilling run 30-900 ft					<input checked="" type="checkbox"/> Well 37			Well 37	45.57	
Make up BHA 0-30 ft	1.04	0.01	1.05	3.55					54.68	
Drill to depth 17.5 in 30-900 ft	12.49	0.12	12.61	4.08						Selected Wells: 5/5
Circulate to condition hole	1.04	0.01	1.05	4.12						
Pump slug, sweep, pill, spacer	1.04	0.01	1.05	4.16						
Trip out to depth 900-465.27 ft	0.38	0.00	0.38	4.18						
Lay down BHA 465.27-0 ft	1.04	0.01	1.05	4.22						
Case section	16.07	0.16	16.23	4.90						
Cement section	14.37	0.14	14.51	5.51						
Secure well	13.53	0.13	13.67	6.08						
Construct Section 12.25 in	118.65	1.17	119.82	11.07						
Construct Section 8.5 in	356.48	3.52	360.00	26.08						

Probability Density

Lognormal Distribution Plot: ROP (ft/h) vs. Probability Density

Mean: 34.31

P10: 34.31, P50: 64.32, P90: 100.59

11. In the **Activity Planner**, notice that the Drill to depth ROP estimate has now changed to 60 ft/hr. and that the notes and data attached in the SOP have appeared

The SOP template is responsible for activity notes and attached procedures and the template activity times/speeds.

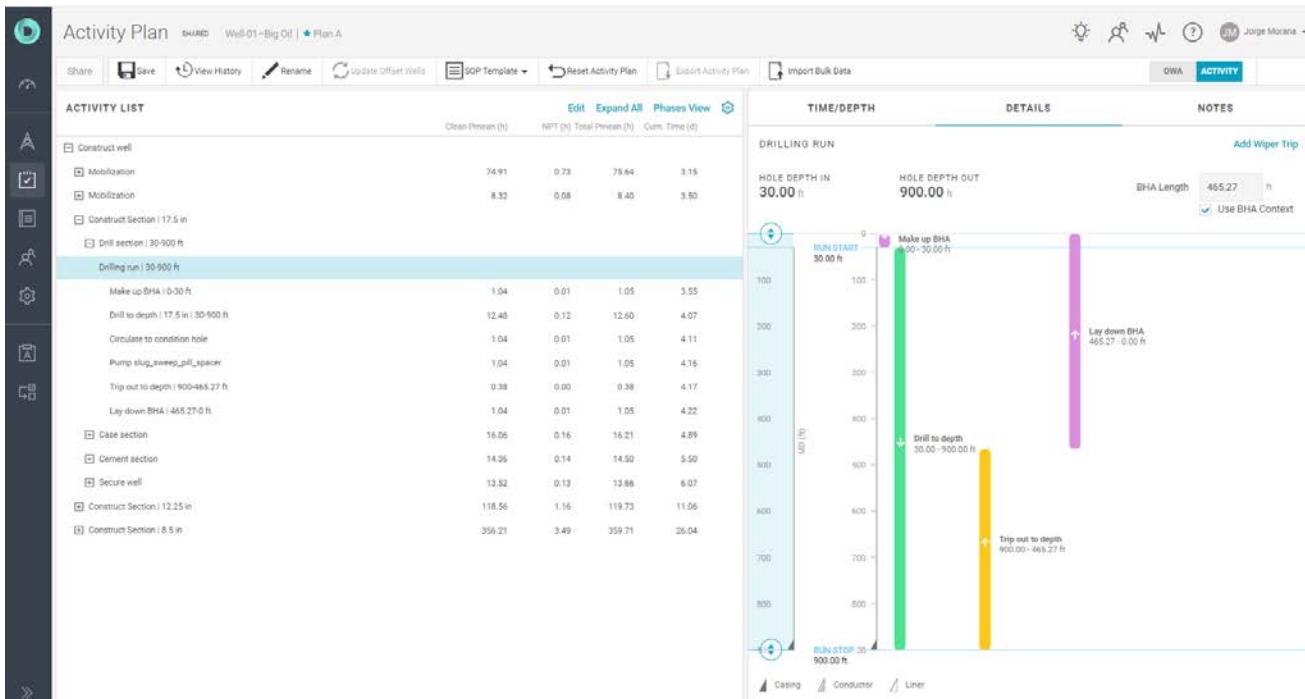
12. You can modify in the Setting menu the calculation method to be applied for the Time vs. Depth curve.

Your options are:

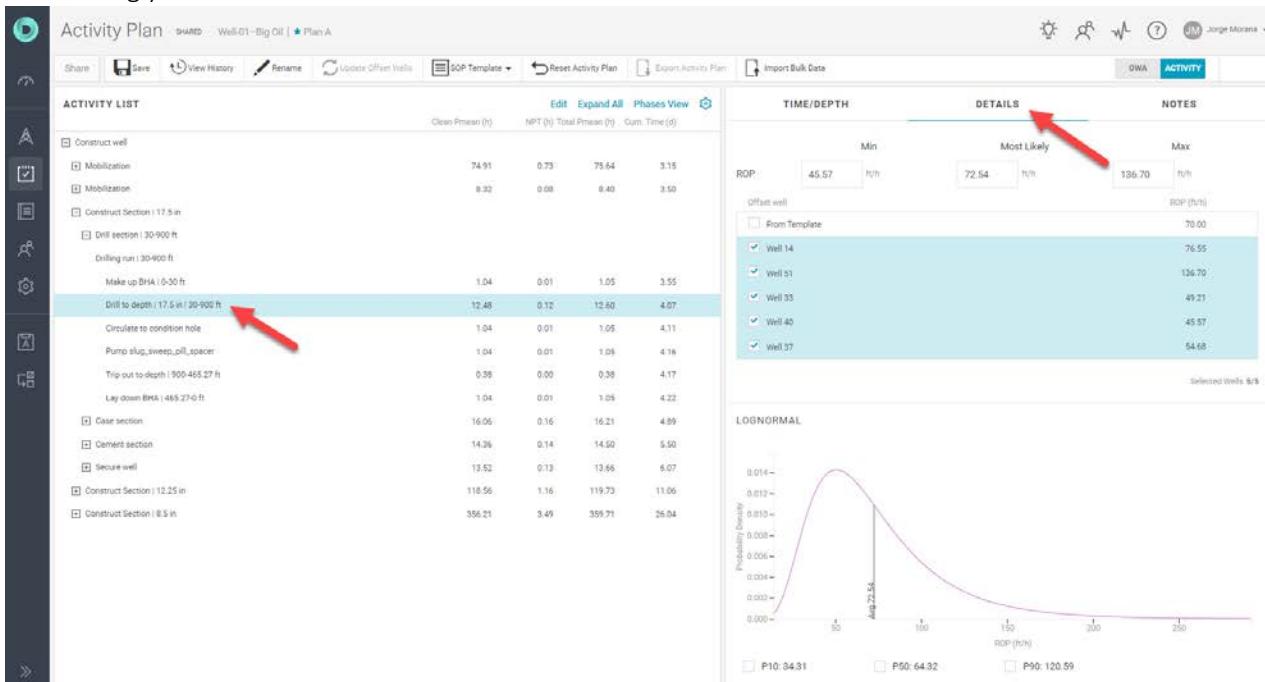
- Deterministic: Clean Time + NPT
 - i. By selecting this option, you will have the opportunity to define the total contingency time you want to apply
- Probabilistic: Σ Clean Time + Risk NPT
 - i. This option instead will give you the option to apply a Monte Carlo analysis to the Critical Activities only or to All Activities. Moreover, you will have the opportunity to select if you want to use the P50 curve as your planning curve or any other user defined curve. By default, the system will plot the P10 and P90 curves in addition to the user defined one

OWA in the activity plan - OWA workflow engine is continuously processing the data in the background to provide the user with the latest information. In the activity plan generation, parameters such as ROP are automatically proposed to the user based on offset wells performance. Similar offset wells that match all or some of the criteria are listed. By default, the results are sorted by similarity, and only the top 30 wells listed are displayed on the OWA plot. If any of the criteria are changed, the search results are updated automatically.

You can select how to sort the results in the Sort by list, for example by similarity, well name, rig name, or spud date. You can also select the offset wells to be used for activity plan analysis. Only the selected offset wells appear as references on the Time/Depth plot. To include or remove a well, select or clear the check box next to the well name.



On the left side, you have all the planned activities which are broad into the well activity sequencing from the template selected/defined in the Project Settings Standard Operating Procedures (SOP). For all the activities that consider the OWA, you can revise the individual statistical analysis by selecting it from the Activity List and switching you view to the Details tab.



The screenshot shows the DrillPlan software interface for an activity plan. On the left, there's a sidebar with icons for sharing, saving, and viewing history. The main area has tabs for 'Activity Plan' (selected), 'SOP Template', 'Reset Activity Plan', 'Export Activity Plan', 'Import Bulk Data', and 'OWA' (which is highlighted in blue).

ACTIVITY LIST: This section lists various well activities with their details. One activity, 'Drill to depth: 17.5 in / 39-900 ft', is highlighted with a red arrow pointing to it. Another red arrow points to the 'DETAILS' tab at the top of the main content area.

TIME/DEPTH: This section shows ROP (Rate of Penetration) data. It includes columns for 'Min', 'Most Likely', and 'Max'. A red arrow points to the 'Most Likely' column.

NOTES: This section contains a table of offset well ROP data. A red arrow points to the first row of this table.

LOGNORMAL: This section displays a lognormal distribution curve for ROP. It includes P10, P50, and P90 values. A red arrow points to the peak of the distribution curve.

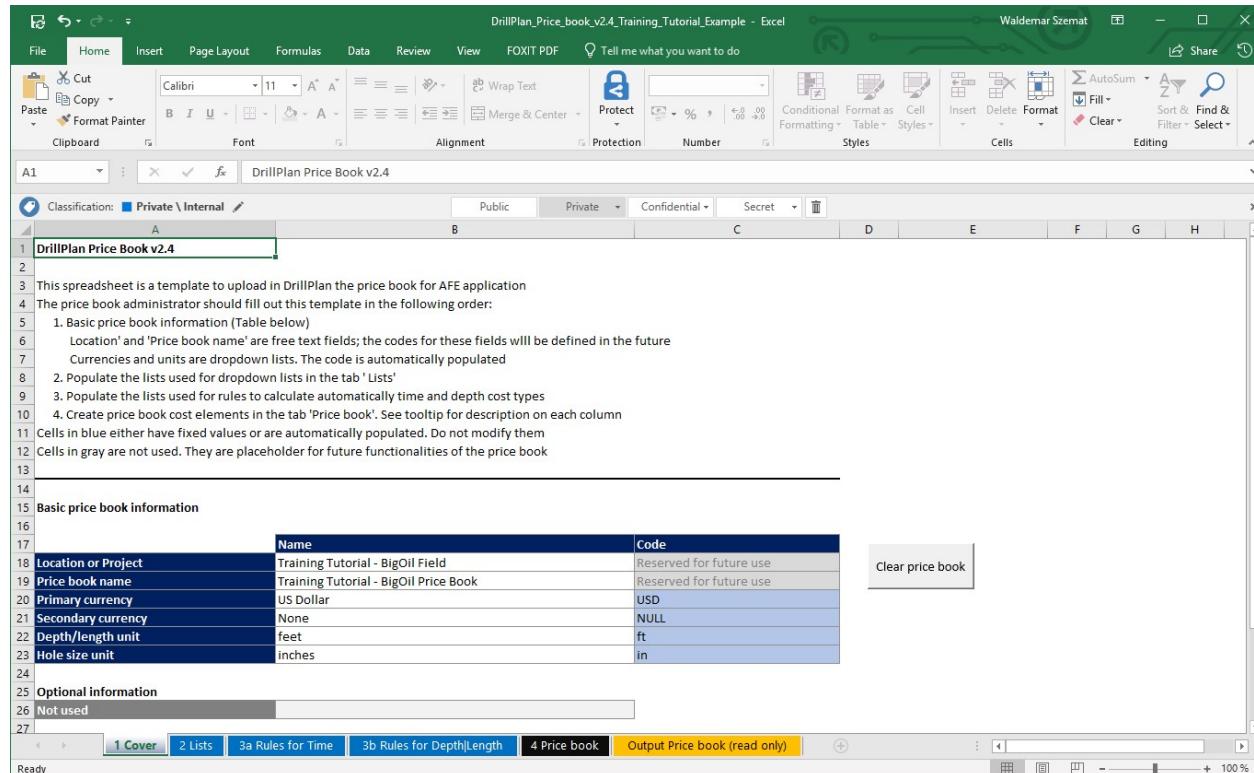
When you are done, remember to Share to make the plan available for the team.

4.22 Authorization for Expenditure (AFE)

4.22.1 Define the rules for a Price Book in Microsoft Excel

If you want to create your own price book, you need to modify the rules and items in the provided Microsoft Excel template.

1. Open the price book template in Microsoft Excel



Name	Code
Location or Project	Training Tutorial - BigOil Field
Price book name	Training Tutorial - BigOil Price Book
Primary currency	US Dollar
Secondary currency	None
Depth/length unit	feet
Hole size unit	inches

2. Fill the 1 Cover tab with the appropriate data

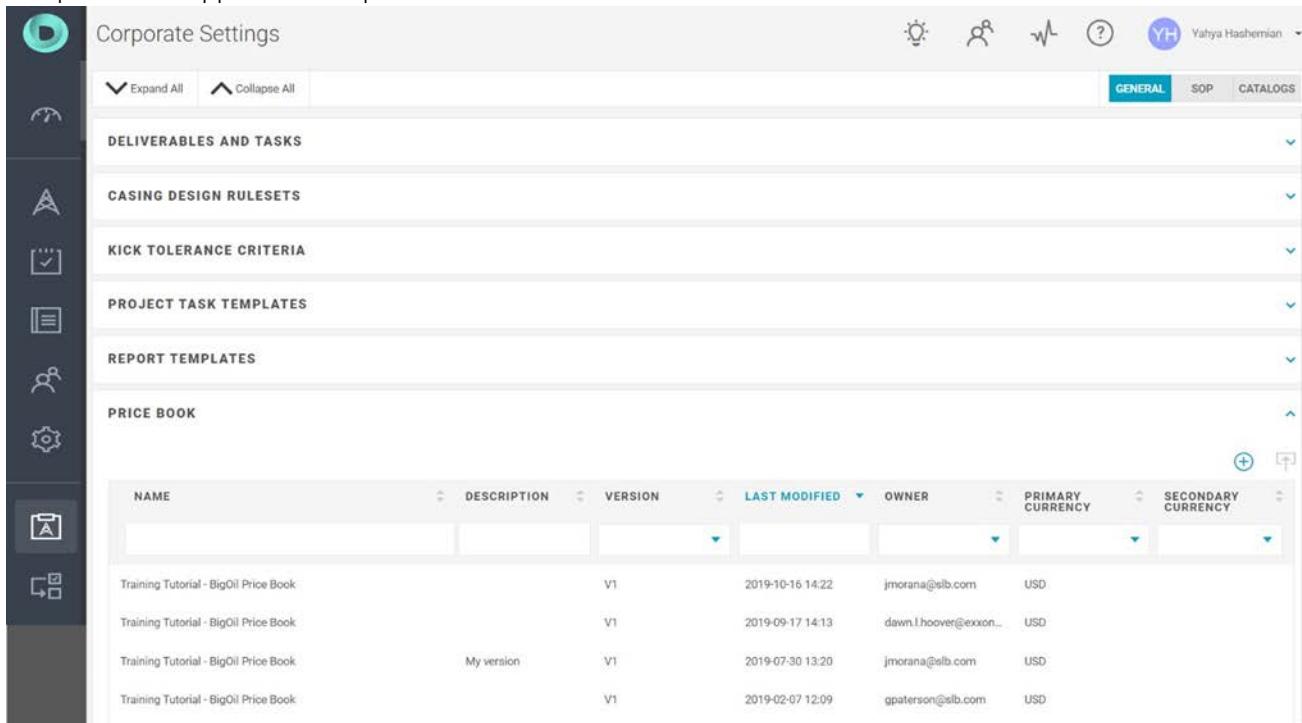
- It is always a good practice to set a version (i.e. *Training Tutorial - BigOil Price Book_v01*) as part of the price book name
3. In the 2 List tab, define the sub-processes, categories, units and Suppliers that will be used
 - It is always a good practice to also include the well sections as part of the sub-processes as it will be easier to assign costs to a specific section
 4. In the 3a Rules for Time tab, create a new rule for time, or in the 3b Rules for Depth|Length tab, create a rule for depth or length, by using the drop-down selection bar in the Category and assigning it to the corresponding level
 - Note: If you assign multiple rules to the same category, only the first rule takes effect
 5. In the 4 Price book tab, edit the unit price for both primary and secondary (if present) for a price book item
 6. Add additional price book items. Do not copy/paste lines/cells as that might create conflict with the drop-down selection options which will prevent your price book from working
 7. Once done, Save the price book

4.22.2 Import a Price Book template

You can import price book files on the Corporate Settings page if you have Admin Access profile.

1. Select your name in the upper-right corner and then select Corporate Settings
2. On the Corporate Settings page, in the Price Book section (last one), select  Import to open the Add Price Book dialog box
3. In the Add Price Book dialog box, select  and browse to the price book file that you want to import. You can only import price book files in the Excel format provided by DrillPlan
4. Select OK

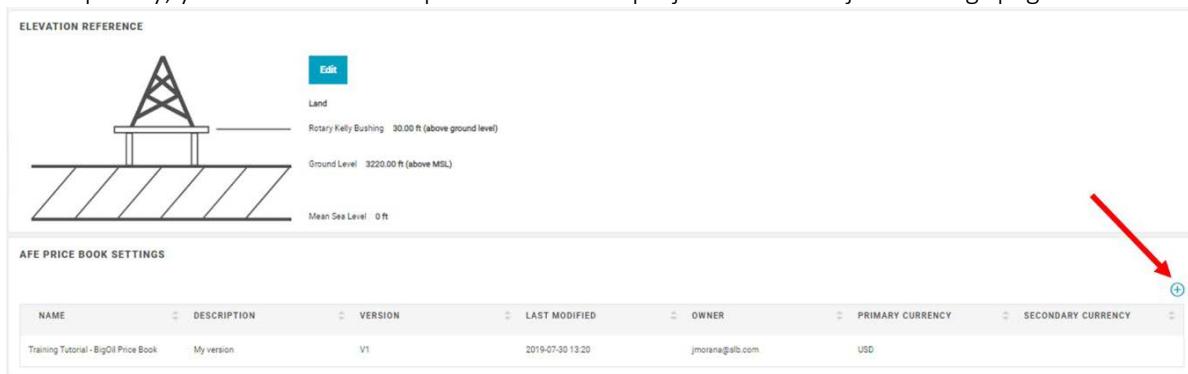
The price book appears in the price book table as shown below.



This screenshot shows the DrillPlan Corporate Settings interface. The left sidebar contains icons for Deliverables and Tasks, Casing Design Rulesets, Kick Tolerance Criteria, Project Task Templates, Report Templates, and Price Book. The main area is titled 'Corporate Settings' and has tabs for GENERAL, SOP, and CATALOGS. Under the GENERAL tab, there are sections for DELIVERABLES AND TASKS, CASING DESIGN RULESETS, KICK TOLERANCE CRITERIA, PROJECT TASK TEMPLATES, REPORT TEMPLATES, and PRICE BOOK. The PRICE BOOK section contains a table with columns: NAME, DESCRIPTION, VERSION, LAST MODIFIED, OWNER, PRIMARY CURRENCY, and SECONDARY CURRENCY. The table lists four entries related to 'Training Tutorial - BigOil Price Book'.

NAME	DESCRIPTION	VERSION	LAST MODIFIED	OWNER	PRIMARY CURRENCY	SECONDARY CURRENCY
Training Tutorial - BigOil Price Book		V1	2019-10-16 14:22	jmorana@slb.com	USD	
Training Tutorial - BigOil Price Book		V1	2019-09-17 14:13	dawn.l.hoover@exxon...	USD	
Training Tutorial - BigOil Price Book	My version	V1	2019-07-30 13:20	jmorana@slb.com	USD	
Training Tutorial - BigOil Price Book		V1	2019-02-07 12:09	gpaterson@slb.com	USD	

Subsequently, you need to link this price book to the project on the Project Settings page.



This screenshot shows the DrillPlan Project Settings page. It features an elevation reference diagram showing a rotary kelly bushing at 30.00 ft above ground level, with ground level at 3220.00 ft above MSL and mean sea level at 0 ft. Below the diagram is a table titled 'AFE PRICE BOOK SETTINGS' with columns: NAME, DESCRIPTION, VERSION, LAST MODIFIED, OWNER, PRIMARY CURRENCY, and SECONDARY CURRENCY. A red arrow points to the 'Import' button (+) in the top right corner of the table header.

NAME	DESCRIPTION	VERSION	LAST MODIFIED	OWNER	PRIMARY CURRENCY	SECONDARY CURRENCY
Training Tutorial - BigOil Price Book	My version	V1	2019-07-30 13:20	jmorana@slb.com	USD	

4.22.3 Update a Price Book template

Once you have price book file loaded in DrillPlan, you can always update it to create a newer version, either with new rules or updated prices.

1. Go to the Corporate Settings page, in the Price Book pane, select the price book to update in the table, and then select  Update
2. In the Update Price Book dialog box, select  and browse to the updated price book file that you want to import
3. Select OK. The price book is updated in the price book table
4. If you want to apply the updated price book to your project, on the Project Settings page, in the AFE Price Book Settings area, select  Update
5. Go to the AFE object and create a New object where selecting the latest version of the price book

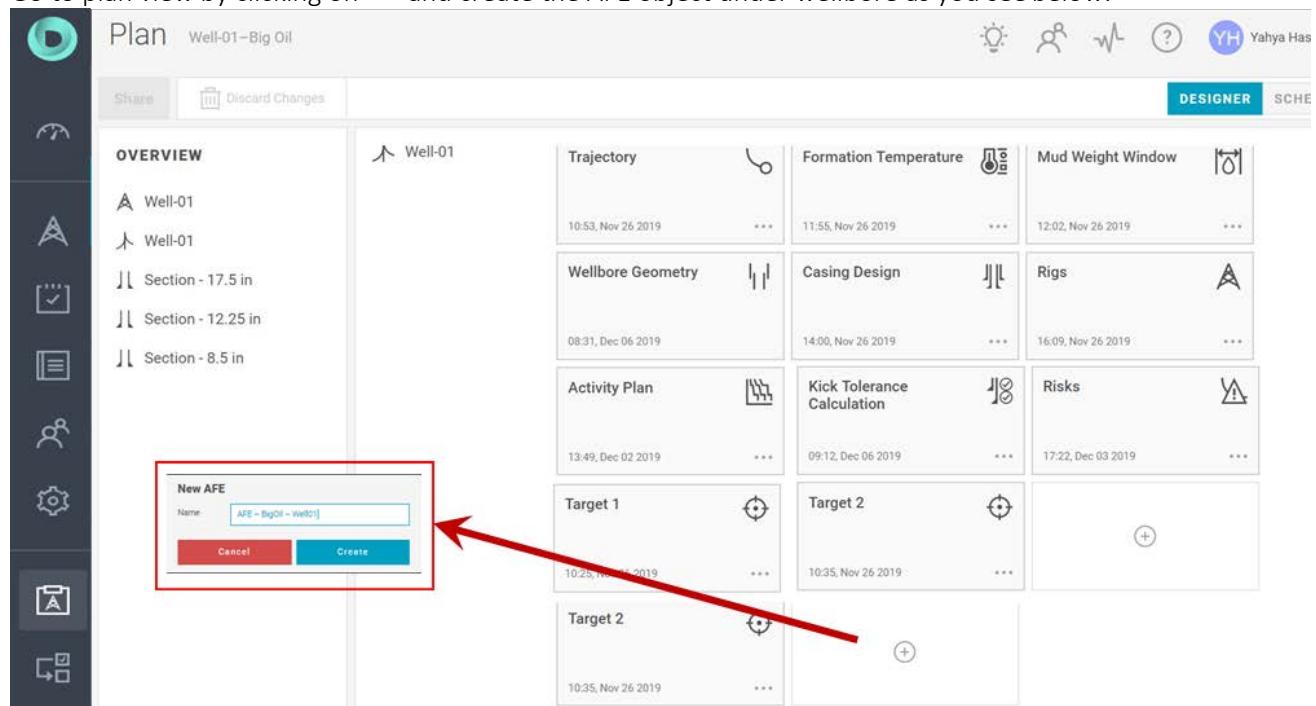
4.22.4 Prepare the Authorization for Expenditure (AFE)

Users can create an AFE on the plan designer view page if they have the correct subscription. You can generate the project AFE based on the latest shared Activity Plan.

The AFE page displays the cost for each operational activity. You can expand each cost in the AFE area to see more details and the AFE page also displays the following charts in the Chart view:

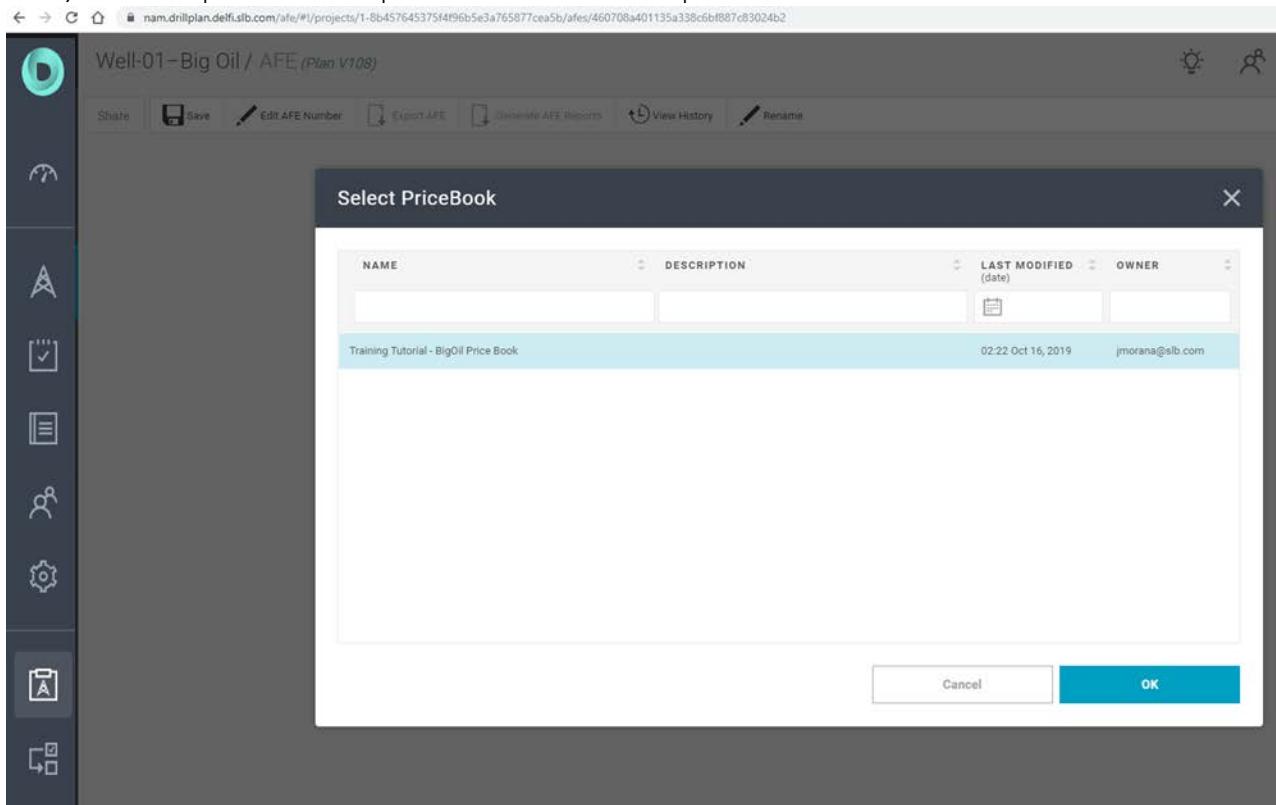
- Cost by category, tangible, supplier, and sub-process/section
- Depth/cost vs time
- Cost vs depth

Go to plan view by clicking on  and create the AFE object under wellbore as you see below:



The screenshot shows the DrillPlan Plan view for the 'Well-01-Big Oil' project. The left sidebar contains icons for Share, Discard Changes, DESIGNER, and SCHE. The main area has tabs for OVERVIEW, Well-01, Trajectory, Formation Temperature, Mud Weight Window, Wellbore Geometry, Casing Design, Rigs, Activity Plan, Kick Tolerance Calculation, Risks, Target 1, Target 2, and Target 3. A red box highlights a modal window titled 'New AFE' with a 'Name' field containing 'AFE - BigOil - Well01'. A red arrow points from this modal to the 'Activity Plan' card, indicating where to click to create the AFE object.

Then, select the price book template from the available options.

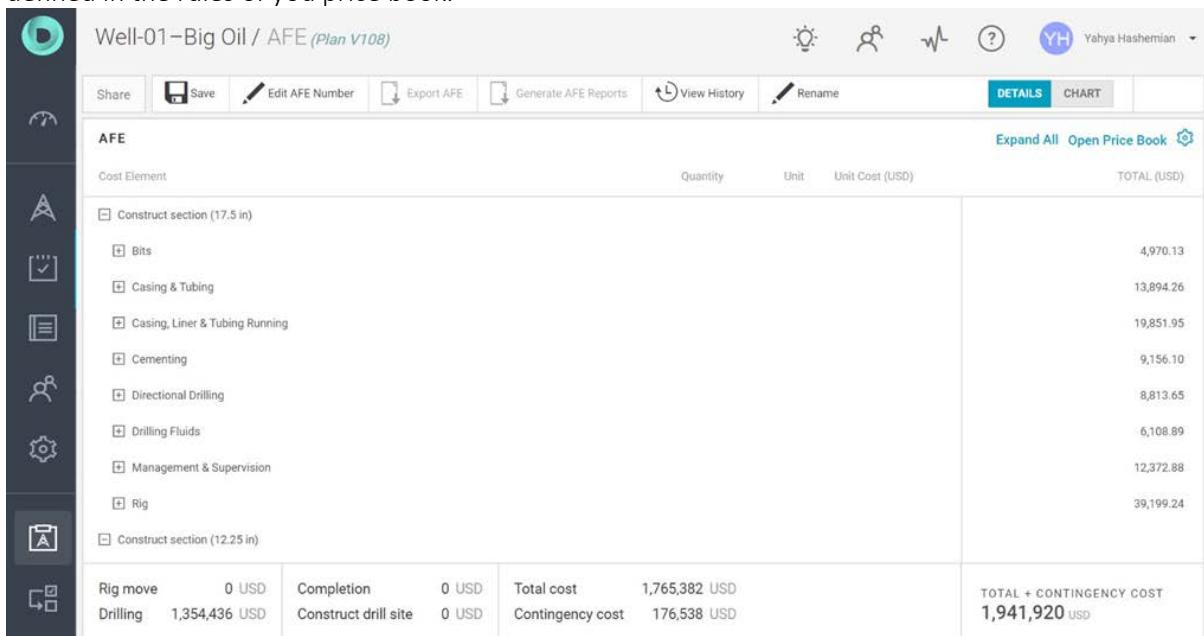


The screenshot shows the 'Select PriceBook' dialog box overlaid on the AFE creation interface. The dialog lists a single price book entry:

NAME	DESCRIPTION	LAST MODIFIED (date)	OWNER
Training Tutorial - BigOil Price Book		02:22 Oct 16, 2019	jmorana@slb.com

Buttons at the bottom of the dialog are 'Cancel' and 'OK'.

When your AFE object is created, you will be able to see the individual cost per section and specific items as defined in the rules of your price book.

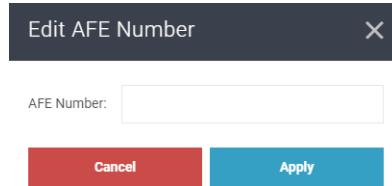


Cost Element	Quantity	Unit	Unit Cost (USD)	TOTAL (USD)		
Construct section (17.5 in)						
Bits				4,970.13		
Casing & Tubing				13,894.26		
Casing, Liner & Tubing Running				19,851.95		
Cementing				9,156.10		
Directional Drilling				8,813.65		
Drilling Fluids				6,108.89		
Management & Supervision				12,372.88		
Rig				39,199.24		
Construct section (12.25 in)						
Rig move	0 USD	Completion	0 USD	Total cost	1,765,382 USD	
Drilling	1,354,436 USD	Construct drill site	0 USD	Contingency cost	176,538 USD	
					TOTAL + CONTINGENCY COST	1,941,920 USD

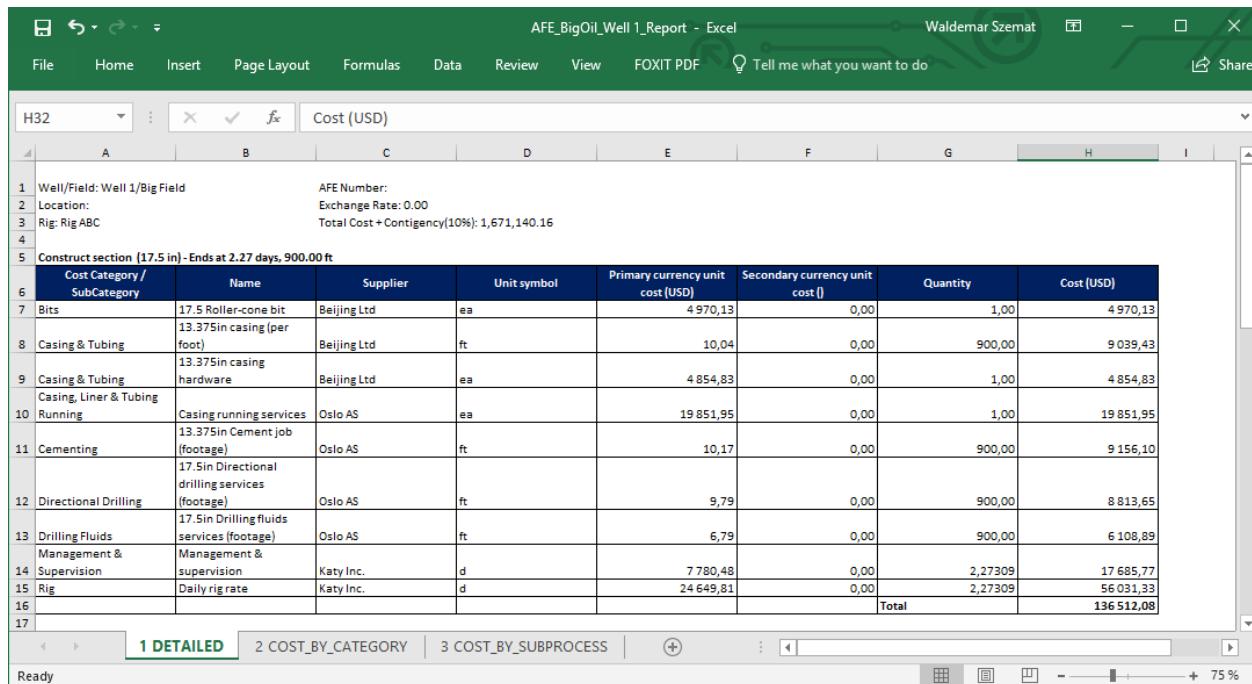
The AFE page shows the cost per operational activities (as per rules defined in the price book template). You can expand the AFE cost to see details. The AFE page also shows the following charts:

- Cost vs. Category
- Cost vs. Time & Cost vs. Depth
- Cost vs. Depth

You can edit the AFE number by clicking Edit AFE Number on the command bar:

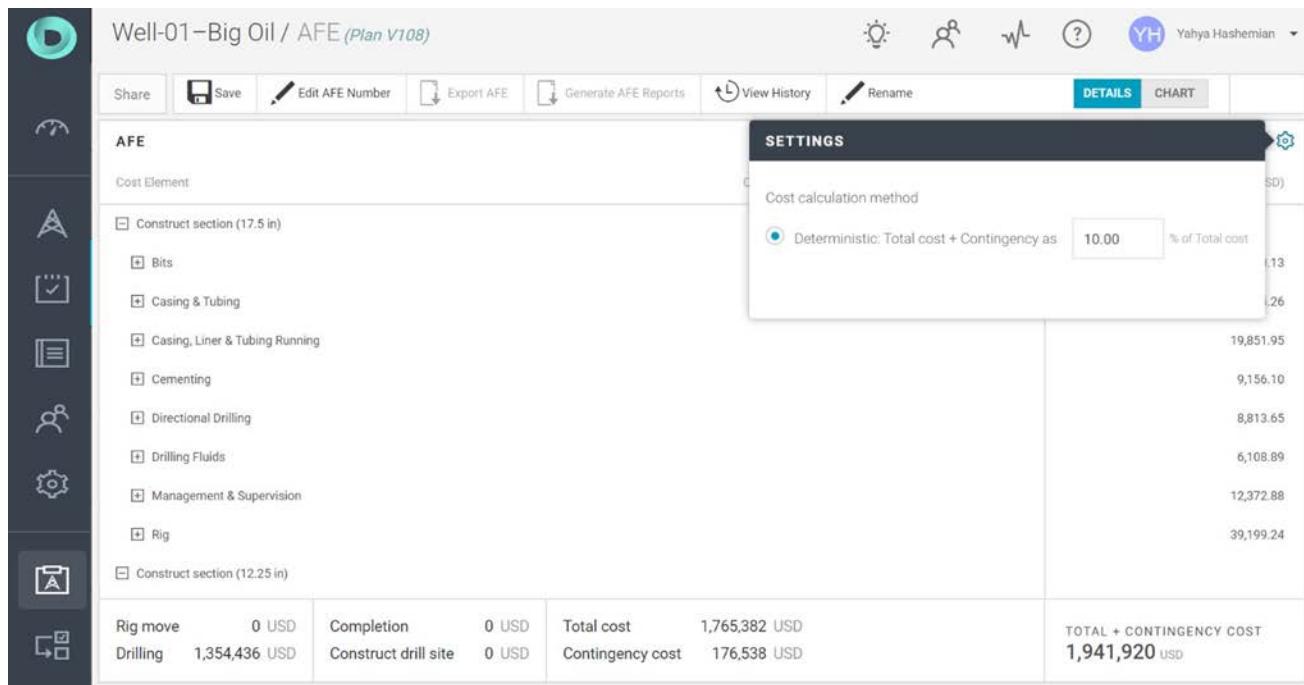


As part of the access restrictions, the final AFE won't be included in the automated report. However, is available from the Generate AFE Reports on the command bar. This action generates a MS Excel file with all the details required as part of the AFE process.



The screenshot shows an Excel spreadsheet titled "AFE_BigOil_Well 1_Report - Excel". At the top, there are several tabs: File, Home, Insert, Page Layout, Formulas, Data, Review, View, FOXIT PDF, and a search bar. The main content area contains a table with columns for Cost Category/SubCategory, Name, Supplier, Unit symbol, Primary currency unit cost (USD), Secondary currency unit cost, Quantity, and Cost (USD). The table includes rows for Bits, Casing & Tubing, Drilling Fluids, Management & Supervision, and Rig. The total cost is listed as 1,671,140.16 USD.

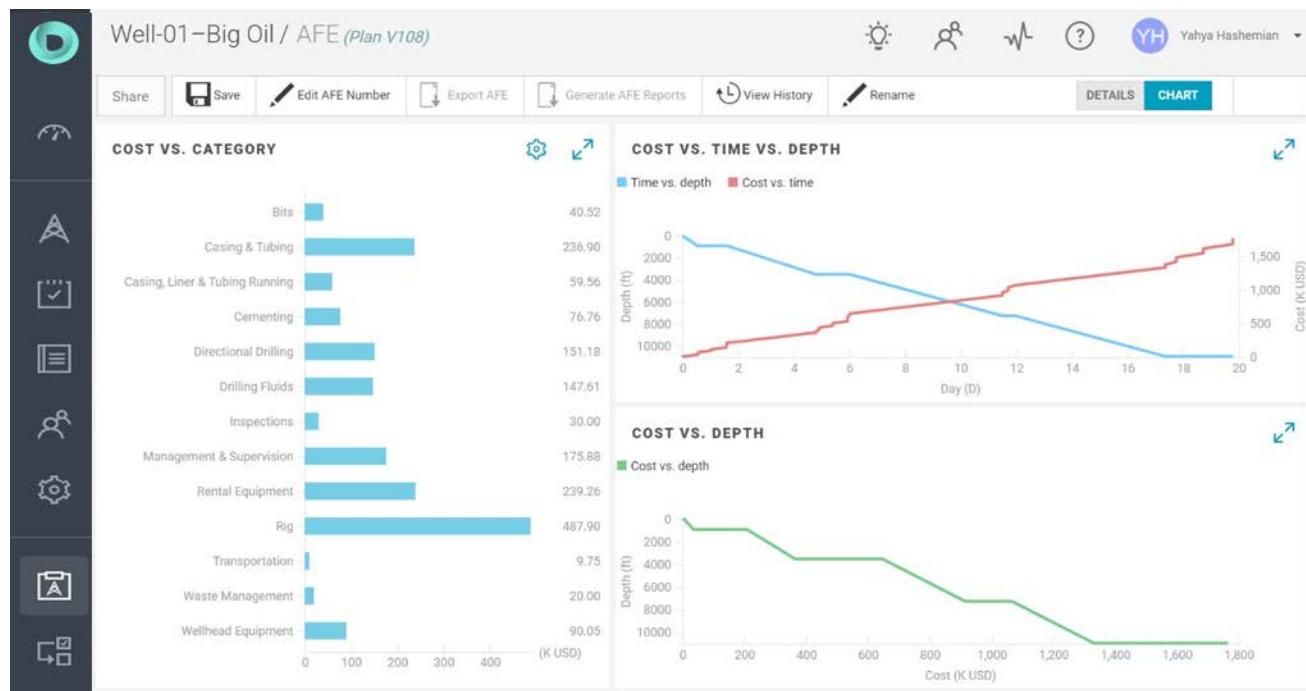
Additionally, you can change the total contingency cost to be applied at the end (as default, 10%) in the Settings menu.



The screenshot shows the DrillPlan software interface for the "Well-01-Big Oil / AFE" plan. On the left, there is a sidebar with icons for Share, Save, Edit AFE Number, Export AFE, Generate AFE Reports, View History, Rename, and a Details/Chart switch. The main area shows a tree view of cost elements: Construct section (17.5 in), Bits, Casing & Tubing, Casing, Liner & Tubing Running, Cementing, Directional Drilling, Drilling Fluids, Management & Supervision, and Rig. Below this, there is a summary table with columns for Rig move, Completion, Total cost, and Contingency cost. On the right, a "SETTINGS" panel is open, showing the "Cost calculation method" set to "Deterministic: Total cost + Contingency as % of Total cost" with a value of 10.00%.

Moreover, you can change the view to Chart to see:

- The cost vs. category in a bar plot
- Cost vs. Time vs. Depth linear plot
- Cumulative Cost vs. Depth linear plot



When done, remember to Share and set the Progress bar accordingly.

4.22.5 Update an AFE

After an AFE object is created, if the Activity Plan is updated and shared, on the AFE page you will see a message button which reads AFE is out of date. Click on it to merge, meaning to have the AFE engine to recalculate the costs based on the newest shared Activity Plan.

4.23 Reports – Drilling Program

When the project planning is complete, DrillPlan allows users to generate an automated report (or drilling program) with a single click using a defined template. You can then edit the content of the report manually, as required.

Synchronized DrillPlan content (tables, plots and images automatically generated from the approved and validated engineering data within the project) can be inserted into the report and updated with Update Report.

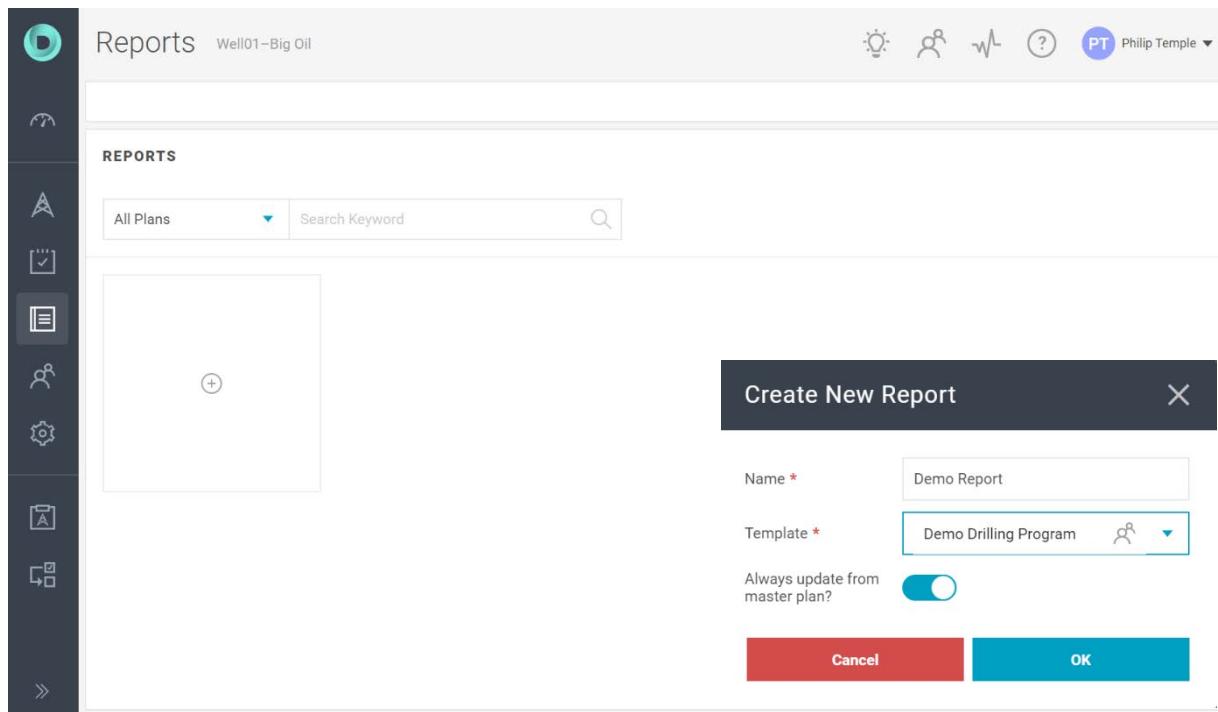
You can assign roles to users for report writing and peer review. When a report is fully approved, you can lock it to prevent further editing. Authorized users can later unlock the report to re-enable editing if required.

The Reports page displays a report card for each report created within a project that shows the following key information:

- Report name
- Template
- Approval progress
- Last updated date (the last time Update Report was run)

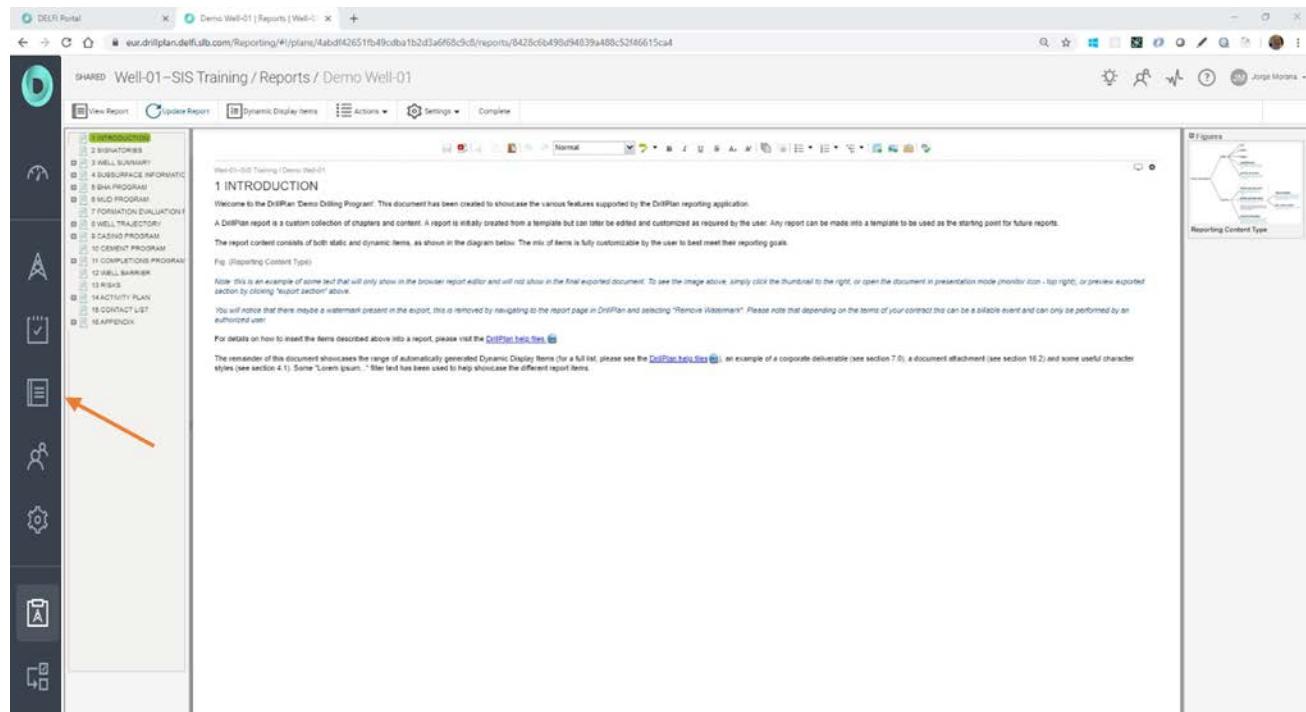
In a project, you can create multiple reports from a list of pre-defined templates. The reports are shown on the Reports page.

8. To open the Reports page, select  Reports on the navigation bar



1. On the Reports page, select  Add Report to open the Create New Report dialog box
2. Enter a report Name.
3. Select a Template from the list (Demo Drilling Program)
4. Select OK

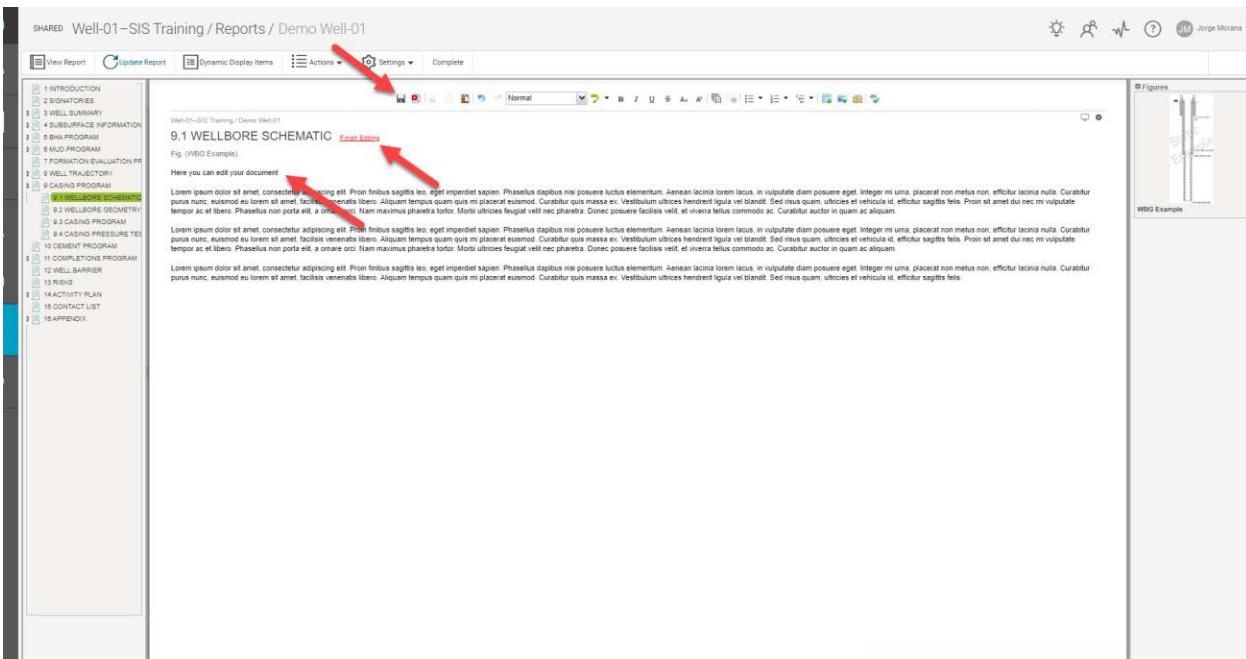
After a few seconds (the time needed to generate the report depends on the size of the template selected and the level of customization), your report is generated and opened ready for editing.



The screenshot shows the DrillPlan report editor interface. On the left is a sidebar with various icons and a list of report sections. In the center is a large text editor area with a toolbar at the top. On the right is another sidebar showing a hierarchical tree of report content items.

Once you have created a report, you can edit the content and document structure using the report editor.

1. Browse to the report section that you want to edit in the left-most pane
2. Click anywhere in the central text editor below the section header and start to edit the content. The  Save button becomes available after you make changes

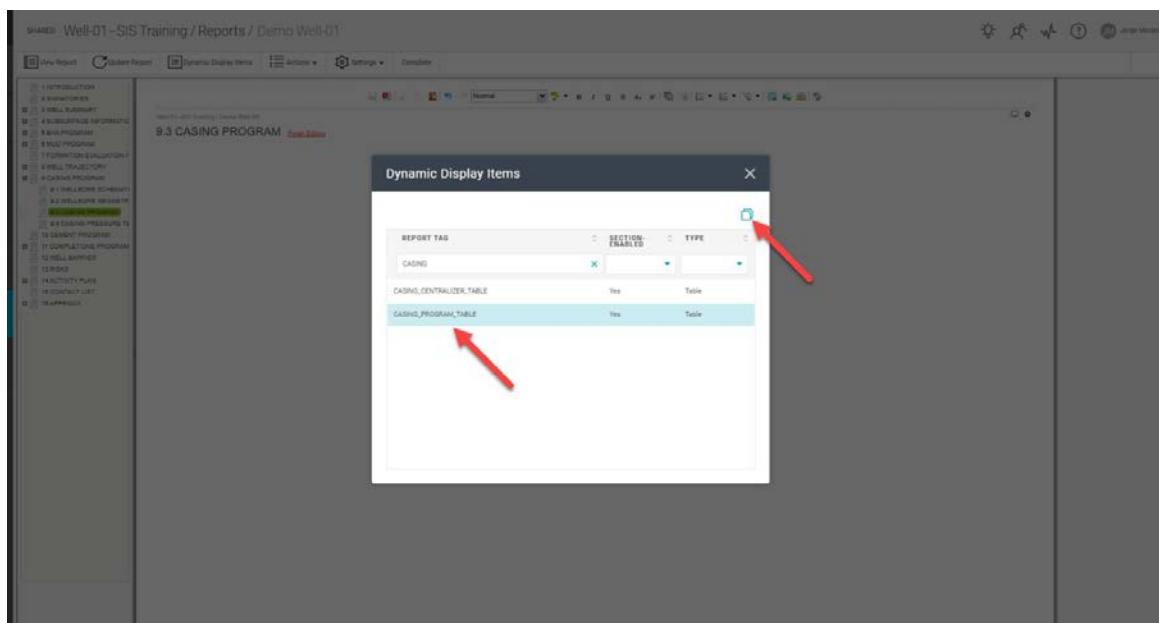


The screenshot shows the DrillPlan report editor in edit mode. The 'Edit' button in the toolbar is highlighted with a red arrow. The central text editor area contains placeholder text for a wellbore schematic. The right sidebar shows a 'WBG Example' diagram.

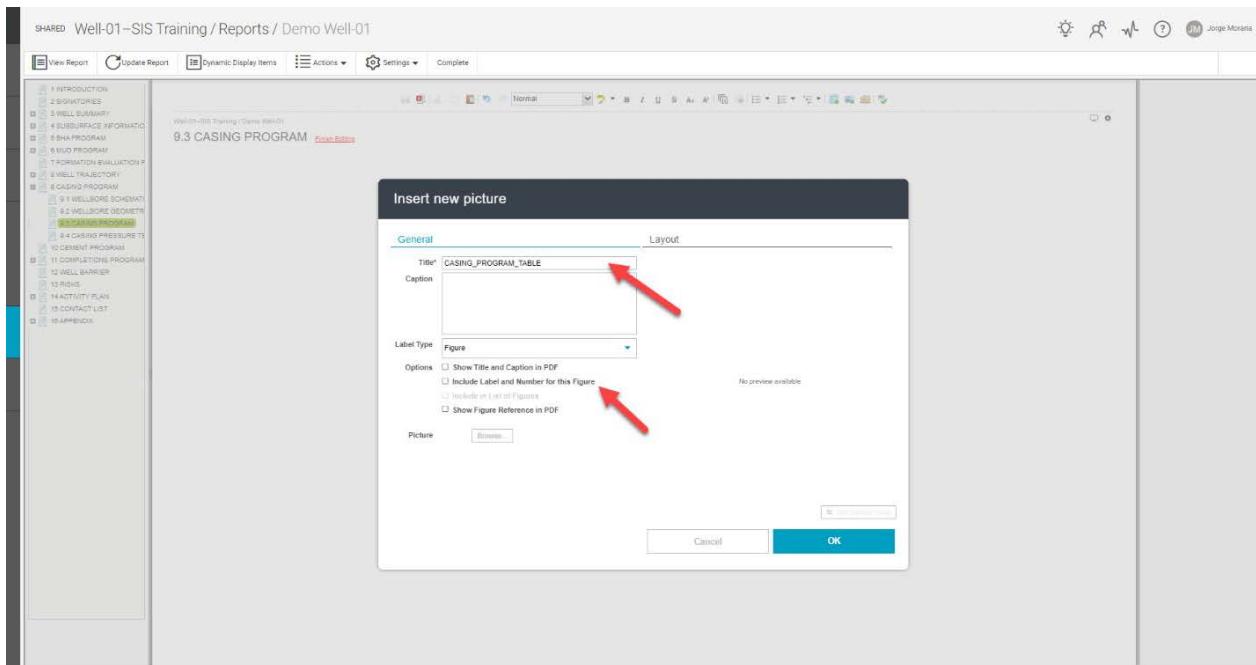
3. Select Finish Editing or Save to ensure the changes are fully captured by the reporting engine

Additionally, you can insert DrillPlan content to a report, known as Dynamic Display Items. These include tables, plots, and graphics automatically generated from the approved and validated engineering data contained within a project.

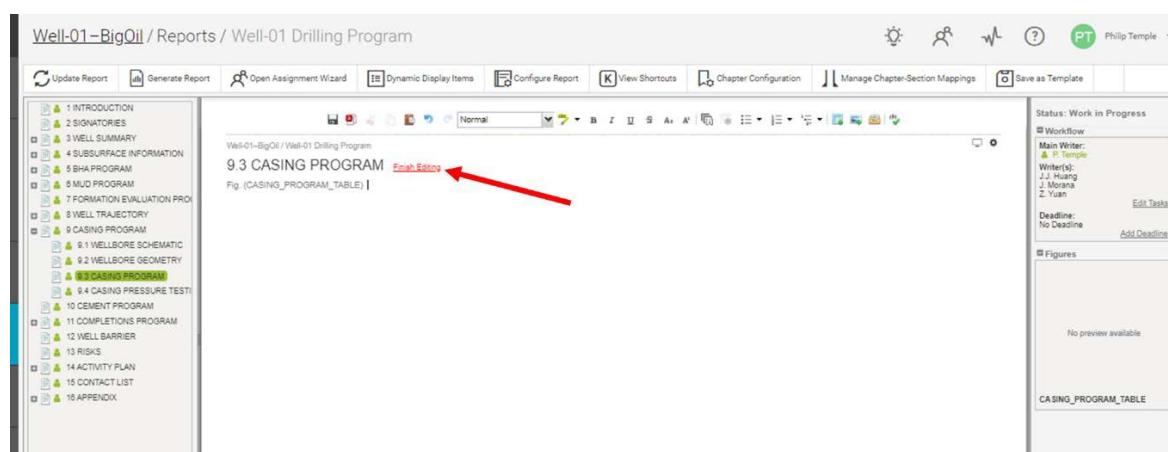
4. Select Dynamic Display Items in the top bar, highlight the item row you'd like to insert, copy the report tag of the content that you want to use with the copy icon, , and then close the DrillPlan content dialog box.



5. Put the cursor where you want to insert the DrillPlan content within the document section
6. Select Insert New Picture to open the Insert New Picture dialog box
7. Paste the report tag of the DrillPlan content into the Title box



8. Keep the Caption box empty
9. Clear the following Options check boxes:
 - Show Title and Caption in PDF
 - Include Label and Number for this Figure
 - Show Figure Reference in PDF
10. Select the Layout tab and define the display of the content in your report
For example: you can specify the size, rotation, vertical position, horizontal position, text wrapping, and alignment. You can also force a specific page to be displayed in landscape to better show your figure or table. In this case, we will use the Standard option
11. Select OK
12. Select Finish Editing at the top of the central report editor pane.



13. Select  Update Report to update the DrillPlan content (this will trigger the report engine and the full report will be re-built)

Similarly, you can use custom figures to include static content that is specific to the current report, like a map or a flowchart.

14. Select Insert New Picture to open the Insert New Picture dialog box

15. Enter a Title and Caption

16. Under Options, select the labeling options for the figure. You have the following options:

- Show Title and Caption in PDF: Select to put the image title and caption below the figure in the final PDF.
- Include Label and Number for this Figure: Select to put the figure number below the figure in the final PDF.
- Show Figure Reference in PDF: Select to add a cross reference to the figure in the text body where your cursor was positioned.

17. Under Picture, select Browse, locate the file you want to insert and select OK

Note: Many image formats are supported, including PDFs. If you insert a multi-page PDF, you can automatically generate one figure per page. Vectorized PDFs will also be retained in the final PDF output when the document is generated.

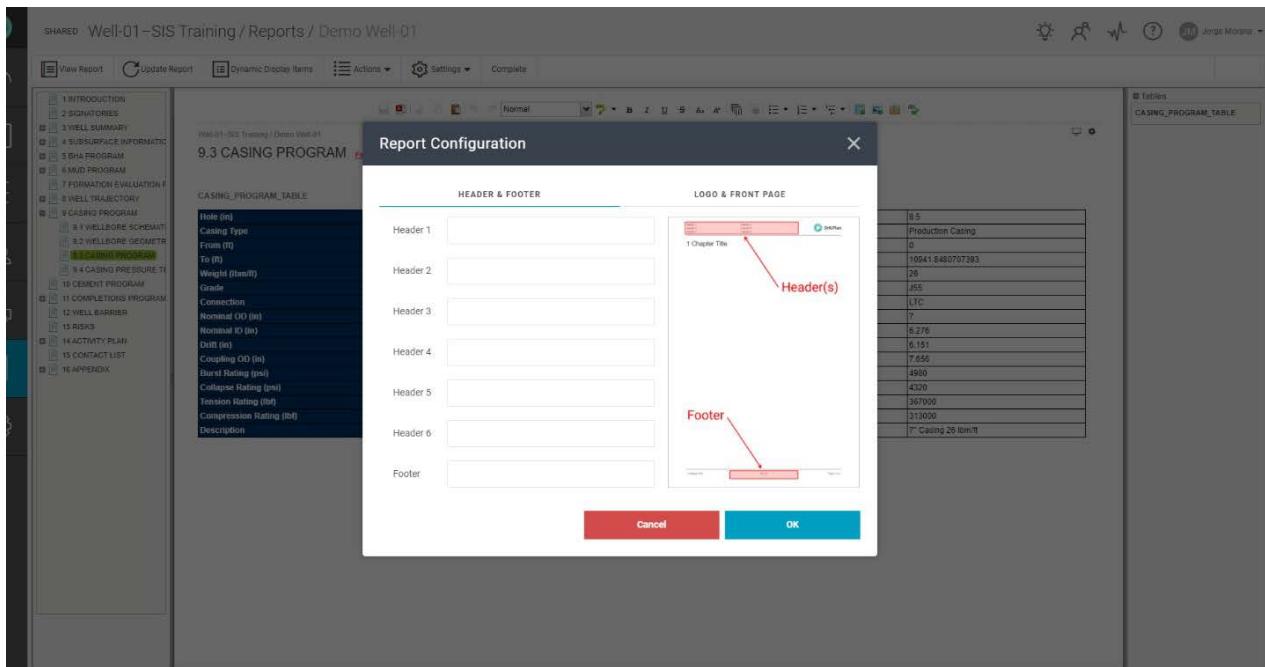
You can also update the report header, footer, logo and front page using the Report Configuration dialog box.



18. Select and select Configure Report from the top bar to open the Report Configuration dialog box

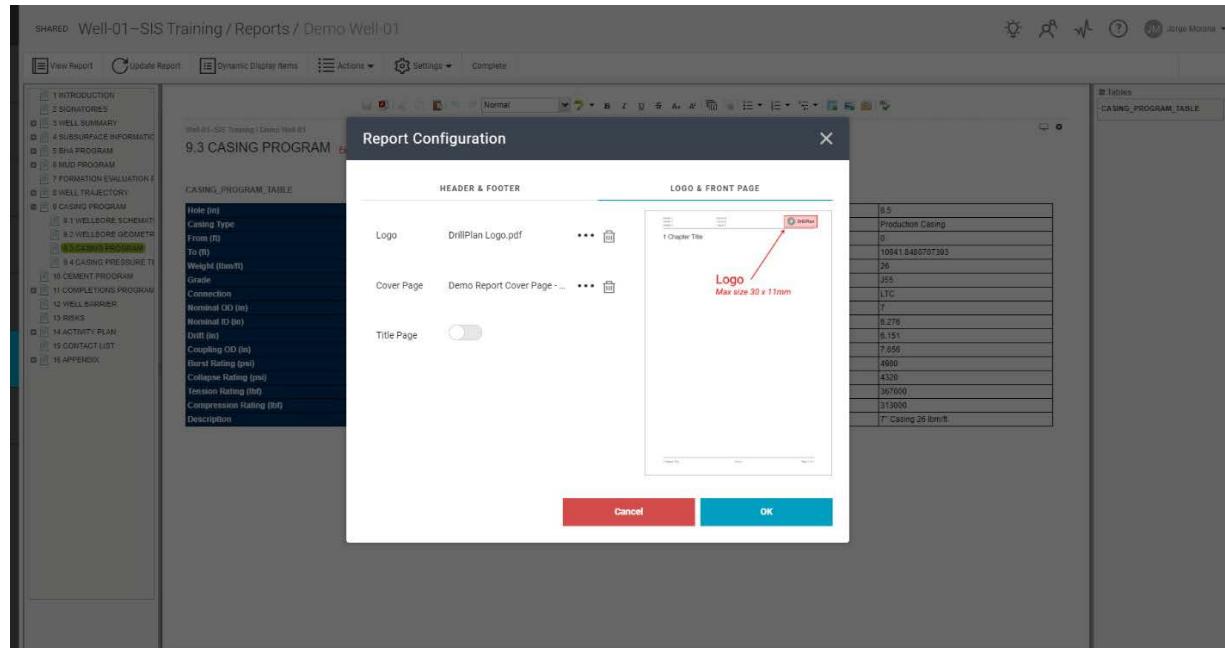
19. Enter text into the Header and/or Footer boxes, as required. Try Well 1 - Drilling Program for the header and CONFIDENTIAL TO WELL 1 for the footer

Note: You can add a maximum of 40 characters per box.



20. To upload a custom logo, first click the LOGO & FRONT PAGE tab, then click  next to Logo, select the image that you want to use, and then click Open

Note: Logo dimensions are limited to 30 x 11 mm, and the image is sized automatically to fit these constraints.



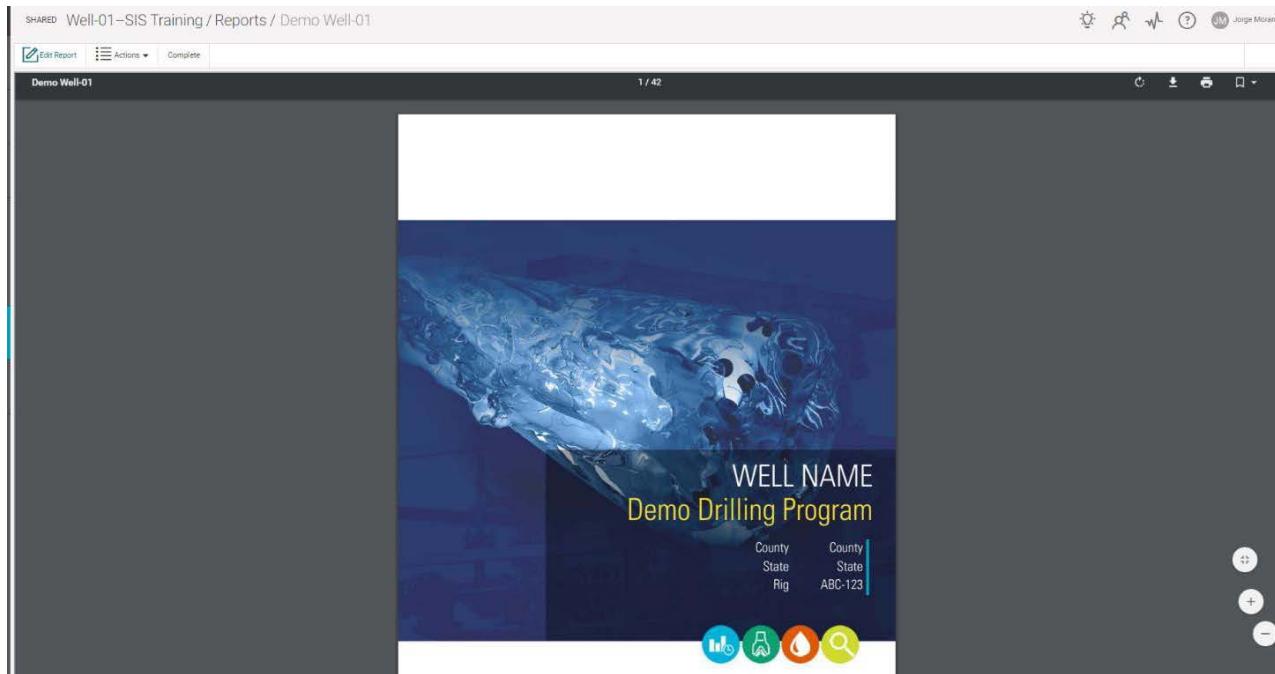
21. To upload a custom cover page, click  next to Cover page, select the front page that you want to use, and then click Open

Note: The cover page must be in .doc or .docx format. For best results, it must match the paper size of your document.

22. Select OK

After doing all the required changes, you can select View Report from the top bar. This will trigger the report engine to generate the PDF version of the report you are working on which will be automatically saved on your computer in the Downloads folder.

When you open the PDF report, you will be able to see all content correctly formatted as per your template definition. You should also see that the Dynamic Display Items show the data corresponding to the latest shared objects in your DrillPlan project.



Section-Based Reports

Finally, it may be desirable to create a section-based report i.e. a report that displays content for one wellbore section at a time. This can be achieved using the *Manage Chapter-Section Mapping* dialog. By assigning report chapters to section diameters, all of the dynamic display items (DDIs) contained within the specified chapters (and sub-chapters), will be filtered to show section specific information. For demonstration purposes, choose a chapter that already contains a section-enabled DDI (list available [here](#)) e.g. "CASING_PROGRAM_TABLE" and assign it to a wellbore section.

1. Got to Actions and Open the *Manage Chapter-Section Mapping* dialog
2. Select a report chapter and a section diameter on the right. Then select OK, to apply the mapping

The screenshot shows the 'Well-01 - SIS Training / Reports / Demo Well-01' interface. The left sidebar contains a navigation tree with sections like INTRODUCTION, WELL TRAJECTORY, Casing Program, SHA Program, and APPENDIX. The main area displays the '9.3 CASING PROGRAM' report. A modal window titled 'Manage Chapter-Section Mapping' is open, showing a list of project sections and their diameters. The 'Report Chapter(s)' dropdown is set to '9.3 CASING PROGRAM'. The 'Project Section Diameter(s)' dropdown has '17.5' selected. Red arrows point to the 'Add Mapping' button at the bottom-left of the modal and the 'In' button next to the selected diameter.

3. Next, run *Update Report*
 4. Once complete, browse back to the chapter and observe the applied filtering

Well-01-SIS Training / Reports / Demo Well-01																																																																			
View Report Update Report Dynamic Display Items Actions Settings Complete																																																																			
<ul style="list-style-type: none"> 1 INTRODUCTION 2 SIGNATURES 3 WELL INFORMATION 4 SUBSURFACE INFORMATION <ul style="list-style-type: none"> 4.1 GEOPHYSICAL 4.2 TARGET COORDINATE 4.3 FORMATION TEMPERA 4.4 PORE PRESSURE AND 4.5 SEISMIC CROSS-SECT 5 HYDRAULICS <ul style="list-style-type: none"> 5.1 BH DETAILS 5.2 HYDRAULICS SUMMAR 5.3 JAR SUMMARY 5.4 TORQUE AND DRAG SI 6 MUD PROGRAM <ul style="list-style-type: none"> 6.1 MUD PROGRAM 6.2 MUD PROGRAMMATION 6.3 WELL TRAJECTORY 7 CASING PROGRAM <ul style="list-style-type: none"> 7.1 Casing Schematic 7.2 Casing Geometric 7.3 Casing Program 8 ACTIVITY PLAN 9 CONTACT LIST 10 APPENDIX 																																																																			
<p>Well-01-SIS Training / Demo Well-01</p> <h3>9.3 CASING PROGRAM</h3> <p>CASING_PROGRAM_TABLE</p> <table border="1"> <thead> <tr> <th>Hole (in)</th> <th>17.5</th> <th>12.25</th> <th>8.5</th> </tr> </thead> <tbody> <tr> <td>Casing Type</td> <td>Casing</td> <td>Casing</td> <td>Production Casing</td> </tr> <tr> <td>Friction (ft)</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>Dx (ft)</td> <td>900</td> <td>1500</td> <td>16941.8480707383</td> </tr> <tr> <td>Weight (lb/in)</td> <td>50.2</td> <td>43.5</td> <td>26</td> </tr> <tr> <td>Grade</td> <td>L80</td> <td>C90</td> <td>J55</td> </tr> <tr> <td>Connection</td> <td>MTC</td> <td>MTC</td> <td>LTC</td> </tr> <tr> <td>Nominal OD (in)</td> <td>13 625</td> <td>9 625</td> <td>7</td> </tr> <tr> <td>Nominal ID (in)</td> <td>13 375</td> <td>9 375</td> <td>6 276</td> </tr> <tr> <td>Drift (in)</td> <td>12.25</td> <td>5.98975</td> <td>6.151</td> </tr> <tr> <td>Coupling OD (in)</td> <td>14.598</td> <td>10.625</td> <td>7.656</td> </tr> <tr> <td>Burst Rating (psi)</td> <td>8420</td> <td>7120</td> <td>4998</td> </tr> <tr> <td>Collapse Rating (psi)</td> <td>3950</td> <td>4010</td> <td>4320</td> </tr> <tr> <td>Internal Rating (psi)</td> <td>20000000</td> <td>15000000</td> <td>3470000</td> </tr> <tr> <td>Compaction Rating (psi)</td> <td>1735000</td> <td>1051000</td> <td>313600</td> </tr> <tr> <td>Description</td> <td>17.625" Casing 80.2 lbm/ft</td> <td>9.625" Casing 45 lbm/ft</td> <td>7" Casing 26 lbm/ft</td> </tr> </tbody> </table>				Hole (in)	17.5	12.25	8.5	Casing Type	Casing	Casing	Production Casing	Friction (ft)	0	0	0	Dx (ft)	900	1500	16941.8480707383	Weight (lb/in)	50.2	43.5	26	Grade	L80	C90	J55	Connection	MTC	MTC	LTC	Nominal OD (in)	13 625	9 625	7	Nominal ID (in)	13 375	9 375	6 276	Drift (in)	12.25	5.98975	6.151	Coupling OD (in)	14.598	10.625	7.656	Burst Rating (psi)	8420	7120	4998	Collapse Rating (psi)	3950	4010	4320	Internal Rating (psi)	20000000	15000000	3470000	Compaction Rating (psi)	1735000	1051000	313600	Description	17.625" Casing 80.2 lbm/ft	9.625" Casing 45 lbm/ft	7" Casing 26 lbm/ft
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<p>Tables</p> <p>CASING_PROGRAM_TABLE</p>																																																																			

Note: the chapter-section mapping is inherited by all sub-chapters of the nominated chapter.

Note: there is no limit to the number of chapter-section mappings.

Finally, you can also use the *Add* button inside the yellow action box to automatically insert a mapped chapter for each missing wellbore section. The chapter(s) inserted will be taken from the default section-based template installed on the current tenant.

5 Module 5 – Orchestration and Validation

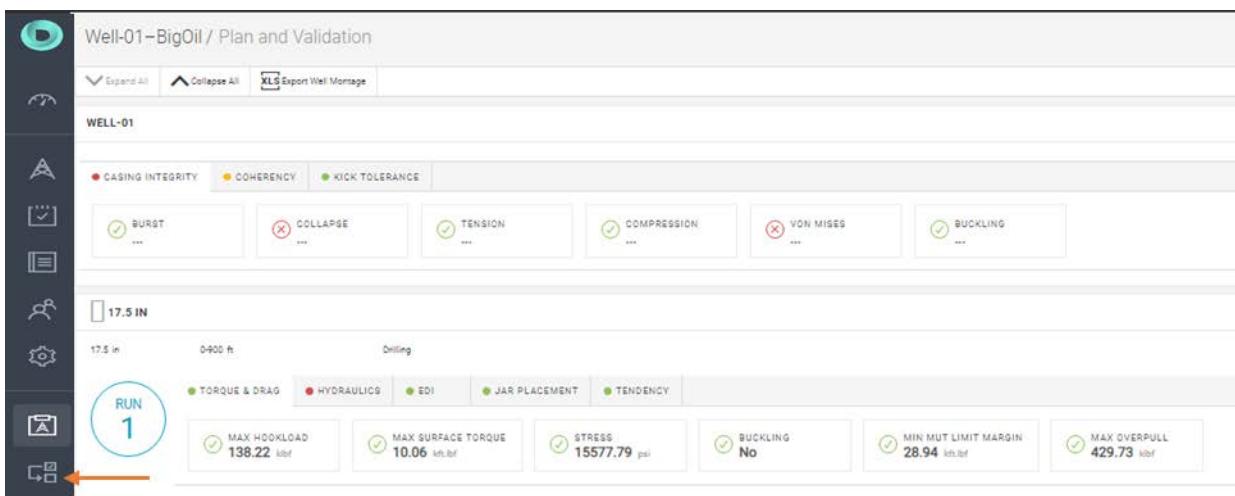
5.1 Plan and Validation

One of DrillPlan's main attributes is the automatic object (data) interdependency which renders the simulation process much simpler. All different data inputs are inter-connected with others to ensure the coherency of the plan all across in the event of a late change on any of the input points.

You can use the Plan and validation tool to analyze and validate designs.

You can view various engineering calculations such as Torque & Drag, Hydraulics, BHA Tendency, BHA dynamic, BHA Magnetic Interference, Trajectory Anti-Collision analysis and others. Each design editor has this tool on its page. The results are calculated automatically when you change the design or the related data on the Context pane.

You can use the project Plan and Validation page to view all the analysis and validation results in this project.



Category	Value
MAX HOOKLOAD	138.22 kN
MAX SURFACE TORQUE	10.06 kNm
STRESS	15577.79 psi
BUCKLING	No
MIN MUD LIMIT MARGIN	28.94 kN
MAX OVERPULL	429.73 kN

The validations are grouped. If a check fails, the card turns red and displays the reasons. A card with a green light does not include any information.

5.2 Well Montage

To summarize your drilling program and well design, you can generate and export a single-page well montage from the Plan and Validation page. The well montage is generated and downloaded as a Microsoft Excel workbook named YYYYMMDDHHMM-[Wellname]-[CustomerName].xlsx. The workbook's first worksheet (Drilling Summary tab) consists of the well montage.

Note: Some boxes are empty, because DrillPlan does not currently store data associated to them. You can edit the content before printing the worksheet.

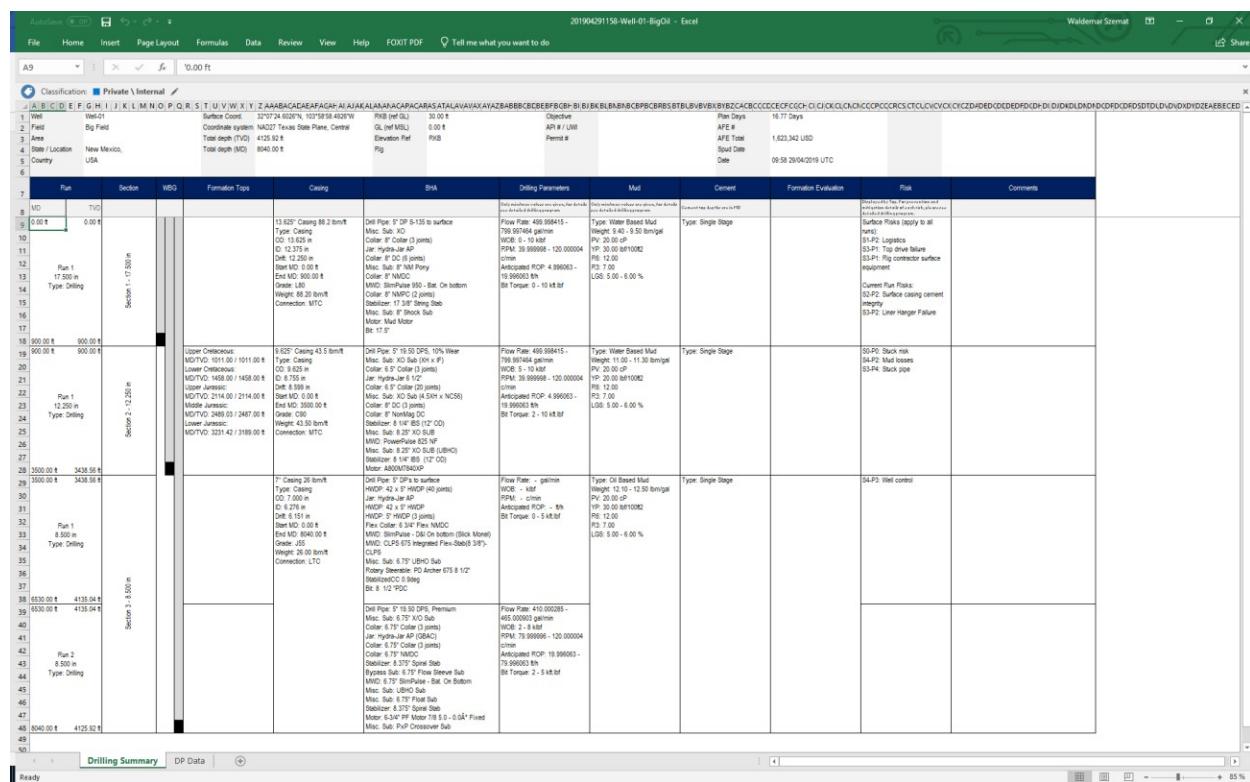
The second worksheet (DP Data) contains the same data tabulated with corresponding reference names. This data has been added to the Microsoft Excel name manager, functioning as a convenient input worksheet for aftermarket customization and reformatting.

Note: All of the named references have the prefix 'DP_.'

Back to your well/project, try the Export Well Montage functionality on the navigation bar.



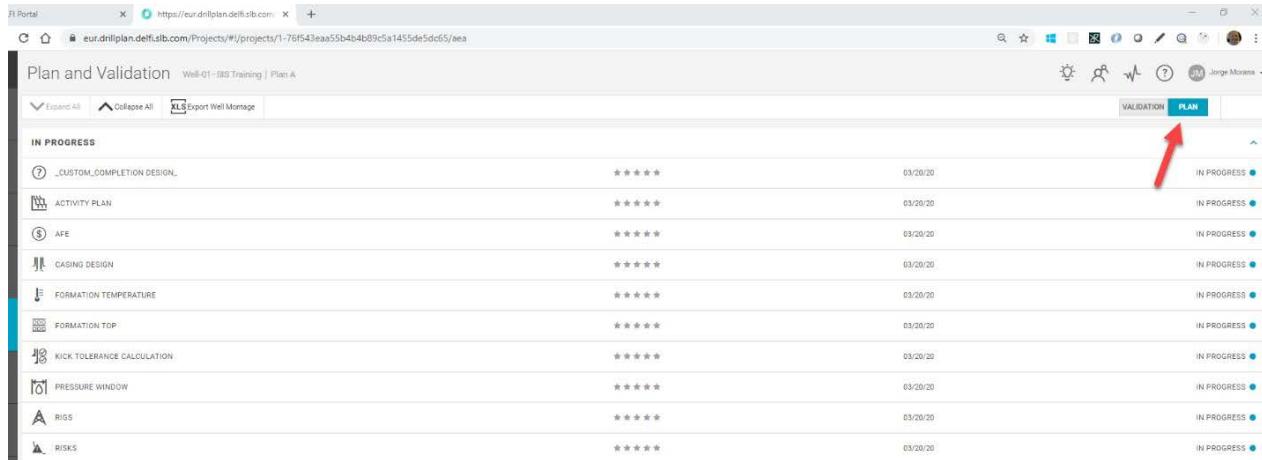
It will take the engine a few seconds to generate the Microsoft Excel file.



5.3 Digital Review/Approve Process

This process allows you to inbuilt the digital review and approve system for technical and management sign-off. You can check at any time the progress stage of each one of the workflow defined objects in the Plan tab of the Plan and Validation page.

Yours should like this this:



Object	Progress	Last Update	Status
_CUSTOM_COMPLETION DESIGN_	*****	03/20/20	IN PROGRESS ●
ACTIVITY PLAN	*****	03/20/20	IN PROGRESS ●
AFE	*****	03/20/20	IN PROGRESS ●
CASING DESIGN	*****	03/20/20	IN PROGRESS ●
FORMATION TEMPERATURE	*****	03/20/20	IN PROGRESS ●
FORMATION TOP	*****	03/20/20	IN PROGRESS ●
KICK TOLERANCE CALCULATION	*****	03/20/20	IN PROGRESS ●
PRESSURE WINDOW	*****	03/20/20	IN PROGRESS ●
RIGS	*****	03/20/20	IN PROGRESS ●
RISKS	*****	03/20/20	IN PROGRESS ●

If you Collapse All, you will be able to see of four options:

- (1) In progress; (2) In review (3) In approval; (4) Completed

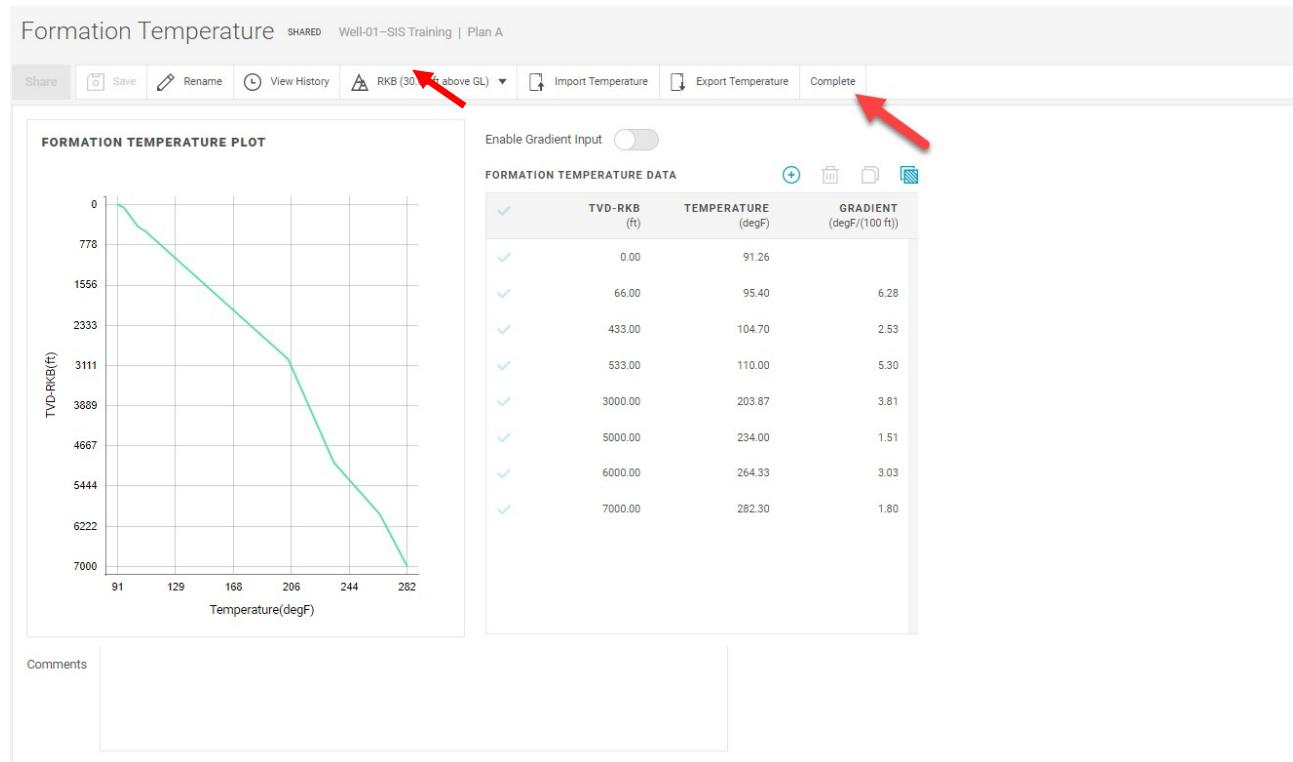
For convenience, by hovering your mouse over any of the objects, you will have the option to select it and go to the corresponding page to check in detail the status of the process.

As example, on the In Progress section, hover your mouse over the Formation Temperature object and select it.



Object	Progress	Last Update	Status
_CUSTOM_COMPLETION DESIGN_	*****	03/20/20	IN PROGRESS ●
ACTIVITY PLAN	*****	03/20/20	IN PROGRESS ●
AFE	*****	03/20/20	IN PROGRESS ●
CASING DESIGN	*****	03/20/20	IN PROGRESS ●
FORMATION TEMPERATURE	*****	03/20/20	IN PROGRESS ●
FORMATION TOP	*****	03/20/20	IN PROGRESS ●
KICK TOLERANCE CALCULATION	*****	03/20/20	IN PROGRESS ●
PRESSURE WINDOW	*****	03/20/20	IN PROGRESS ●
RIGS	*****	03/20/20	IN PROGRESS ●

Now you will be taken into the Formation Temperature object which was previously finished (as noted on the progress bar) but was mistakenly not set as Complete.

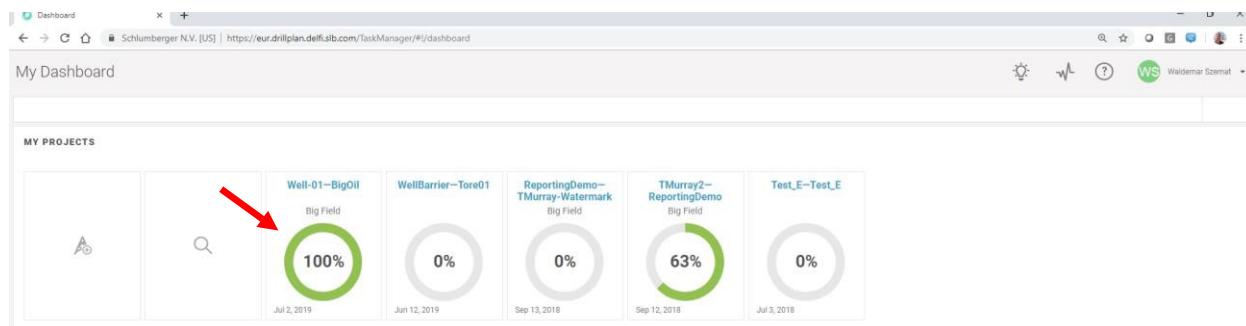


Now select Complete and browse back to the Plan and Validation page, Plan tab.

You will be able to see now that the Formation Temperature object moved from the In Progress section to the Completed section. This also means that now the object has been passed to the corresponding reviewers and approvers for their final sign-off.

5.4 Project Finalization

If you now go back to DrillPlan main page (your dashboard), you will be able to see your well is completed.



Congratulations, you have now finished your DrillPlan Fundamentals (Foundation Level) training!

6 Multiple Plans

On the Project page, found by clicking the rig icon , you can see and access all the plans in a project. A project can have multiple plans, but you can only set one of them as the master plan. The master plan is marked with a star image .

The master plan is the main plan that the team is working on. Other plans can be concept evaluations, contingency plans, or similar. You can rename and copy plans and set any plan as the master plan. You can delete plans, except the master plan.

After completing the previous steps in the training document, a contingency plan can be created. For this scenario, the 8.5in section, previously planned to TD, will be finished at the curve at 7,600'. An additional 6.125" section will be drilled to complete the well. A few additions and adjustments will be needed to accommodate this contingency plan:

- Create an additional plan
- Revise the following in the contingency plan:
 - Wellbore geometry
 - Update Scheduler
 - Add 6.125" BHA & corresponding operations parameters
 - Additional 6.125" fluid
 - Additional 4.5" casing cement job
 - Revise the 7" cement job
 - Update Activity Plan

6.1 Creating a contingency plan

As the first step, proceed to the Project page, and click on the ellipses, or three dots, at the bottom right of the TeamPlan.



The screenshot shows the DrillPlan Project page. On the left is a vertical sidebar with icons for Home, Projects, Reports, and Settings. The main area is titled 'Project' and shows a list of plans under the heading 'PLANS'. One plan, 'TeamPlan (v33)', is highlighted with a blue bar at the top labeled '★ MASTER'. Another plan, 'Contingency - 4 section plan', is listed below it with the following details: '22.48 days', '\$ 1,883,670.52 USD', and 'Shared by Philip Temple'. A timestamp '4 minutes ago' is also present. At the bottom of the list is a three-dot menu. A tooltip is overlaid on this menu, containing two options: 'Make a Copy' and 'Rename'.

Click on "Make a Copy" and name the new plan "Contingency – 4 section plan". Your Project page should

look like the following image.

The screenshot shows the DrillPlan Project page for 'Well01-Big Oil'. On the left is a sidebar with various icons. The main area displays two plans:

- TeamPlan (v34)**: Status: 22.48 days, 1,883,670.52 USD, Shared by Philip Temple 39 minutes ago.
- Contingency - 4 section plan (v1)**: Status: 22.48 days, 1,883,670.52 USD, Shared by Philip Temple 20 minutes ago.

6.2 Revising Wellbore Geometry

From the Project page, click the newly created contingency plan. This will take you to the Plan page. Verify you're in the correct Plan page with the header:

Plan Well01-Big Oil | Contingency - 4 section plan

Navigate to the Wellbore Geometry workflow and click the plus sign  on the section table to add a new section. Add the 6.125" section, revise the 8.5" section description to "Intermediate 2", and update the 6.125" section description to "Production". Your contingency plan wellbore geometry should look like the snapshot below.

The screenshot shows the Wellbore Geometry page for the 'Contingency - 4 section plan' under 'Well01-Big Oil'. The top navigation bar includes 'Share', 'View History', 'Rename', 'Save As Template', 'Apply Template', and 'RKB (30.00 ft above Ground Level)'. The validation status is shown as 'OK'.

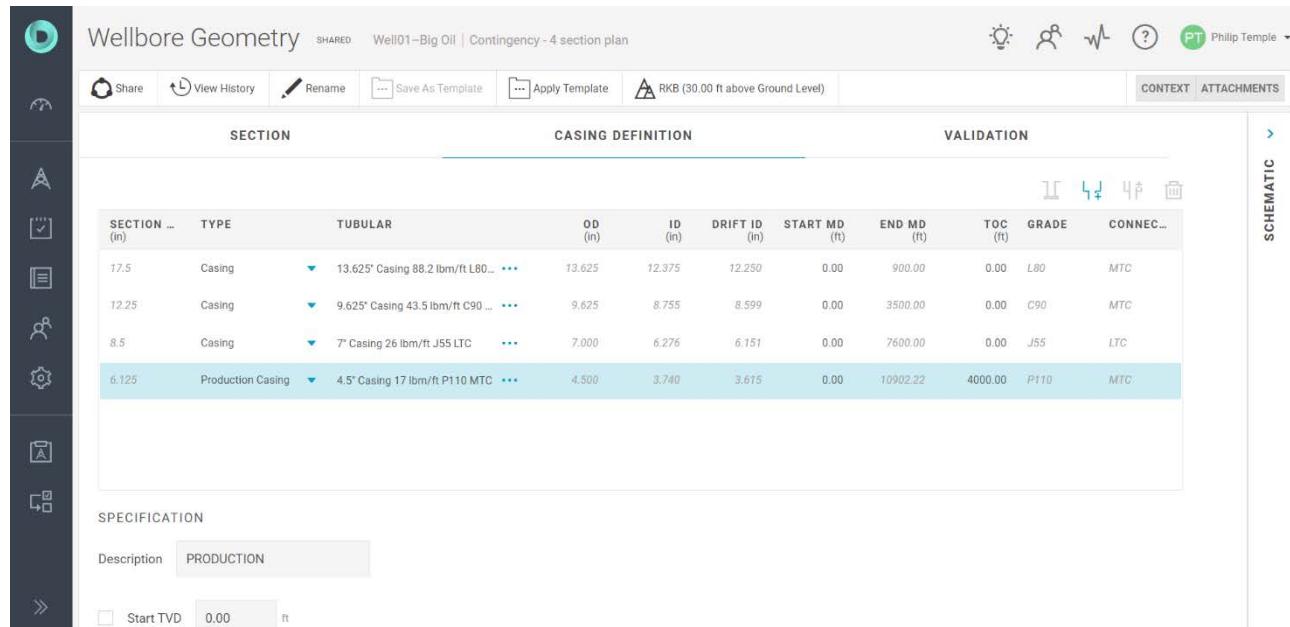
The main area has three tabs: 'SECTION', 'CASING DEFINITION', and 'VALIDATION'. The 'SECTION' tab is active, showing the following table:

SECTION SIZE (in)	LOCK TO (MD/TVD/FM TOP)	END MD (ft)	END TVD (ft)	DESCRIPTION
17.5	MD	900.00	900.00	SURFACE
12.25	MD	3500.00	3500.00	INTERMEDIATE
8.5	MD	7600.00	6928.33	INTERMEDIATE 2
6.125	MD	10941.85	6998.81	PRODUCTION

A checked checkbox says 'Lock the last section to the end of trajectory (10941.85 ft MD)'. To the right is a schematic diagram showing the wellbore trajectory and casing sections. The trajectory starts at 17.5 in - 30.00 ft and goes down to 6.125 in - 900.00 ft. The casing is shown in green, with the production section at the bottom labeled '8.5 in - 3500.00 ft'.

With the additional section, a new casing needs to be added to the well. Navigate to the “casing definition” tab of wellbore geometry, and add 4.5” 17lb/ft P110 MTC production casing to the table. Revise the TOC for the 7” casing to be 0’ (to surface), and put the TOC for the production casing to 4,000’.

Your casing definition should appear as the snapshot below. Make sure to click Share once both the section and casing definition tabs are updated.



The screenshot shows the Wellbore Geometry page for Well01-Big Oil | Contingency - 4 section plan. The Casing Definition tab is selected. The table lists the following sections:

SECTION ... (in)	TYPE	TUBULAR	OD (in)	ID (in)	DRIFT ID (in)	START MD (ft)	END MD (ft)	TOC (ft)	GRADE	CONNEC...
17.5	Casing	13.625" Casing 88.2 lbm/ft L80...	13.625	12.375	12.250	0.00	900.00	0.00	L80	MTC
12.25	Casing	9.625" Casing 43.5 lbm/ft C90 ...	9.625	8.755	8.599	0.00	3500.00	0.00	C90	MTC
8.5	Casing	7" Casing 26 lbm/ft J55 LTC	7.000	6.276	6.151	0.00	7600.00	0.00	J55	LTC
6.125	Production Casing	4.5" Casing 17 lbm/ft P110 MTC	4.500	3.740	3.615	0.00	10902.22	4000.00	P110	MTC

Below the table, under SPECIFICATION, the Production tab is selected. A checkbox for Start TVD is checked, and the value is 0.00 ft.

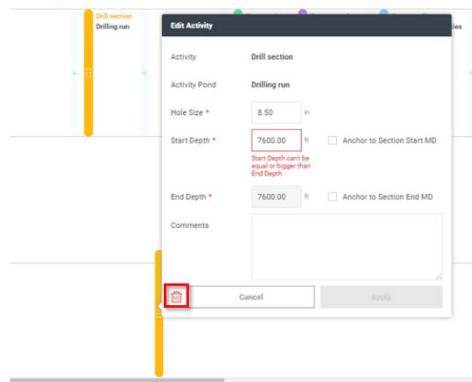
6.3 Update Scheduler

After updating the Wellbore Geometry. The 2nd run of the 8.5 section need to be taken out of the scheduler. Go to the Scheduler tab from the Plan page.



The screenshot shows the Plan page for Well01-Big Oil | Contingency - 4 section plan. The SCHEDULER tab is selected. The timeline shows several operations: Drill section (Drilling run) at 3500 ft, Run casing at 7600 ft, Cement section (Cement casing) at 8000 ft, Secure well (Surface stack activities) at 8500 ft, and another Drill section (Drilling run) at 10902 ft. The second run of the 8.5 section is highlighted with a red box. The left sidebar shows the wellbore structure: Well01, Well01, Section - 17.5 in, Section - 12.25 in, Section - 8.5 in, and Section - 6.125 in. The bottom left corner of the sidebar has a red box around the icon.

You will see an extra Drilling run. Click on the Drilling run bar and select delete 



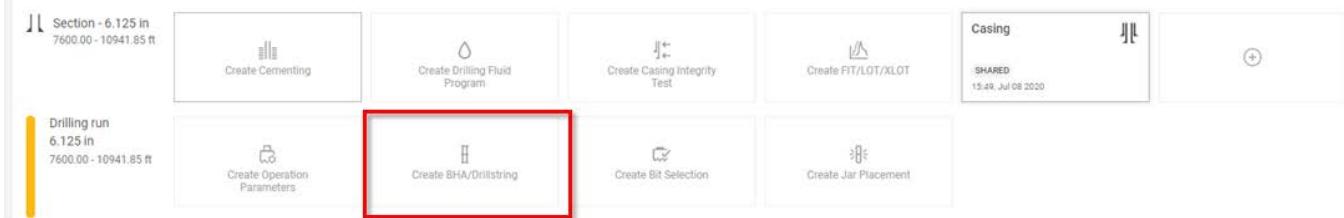
6.4 Add 6.125" Fluids Program



1. Go to the Plan page icon. Go to the 6.125" Section and select the "Create Drilling Fluid Program" object.
2. Click on "Rename" and change the object name to: "6.125" Drilling Fluid Program"
3. Click on the  Import For the import option. Use the file provided, ending with the extension .dfx and names with each respective section, to populate the Drilling Fluid program details. For example, use the 6.125 Drilling Fluid Program.dfx file.
4. Save and Share

6.5 Add 6.125" BHA & corresponding operations parameters

1. On the Plan page, go to the newly added 6.125" section and click "Create BHA/Drillstring"



1. Repeat steps 1 to 13 done in the 17.5 Well section Drilling Run with the using "6.125in Contingency BHA .xml"
2. 6.125" Drilling Parameters Runs Table

Section	Run	WOB (klbf)	RPM (c/min)	Flow Rate (gal/min)	ROP (ft/h)	Bit Torque (kft.lbf)	Motor Diff. Pressure (psi)	Reaming RPM (c/min)	Reaming Speed (ft/h)
6.125"	Run 1	5-10-8	40-120-100	250-290-300	10-120-100	2-6	500	80	200

1. Save to start engine calculations.

1. It may be necessary to reshare the rig workflow with the newly added section.

6.125" section result



6.6 Additional cement job for 4.5" casing

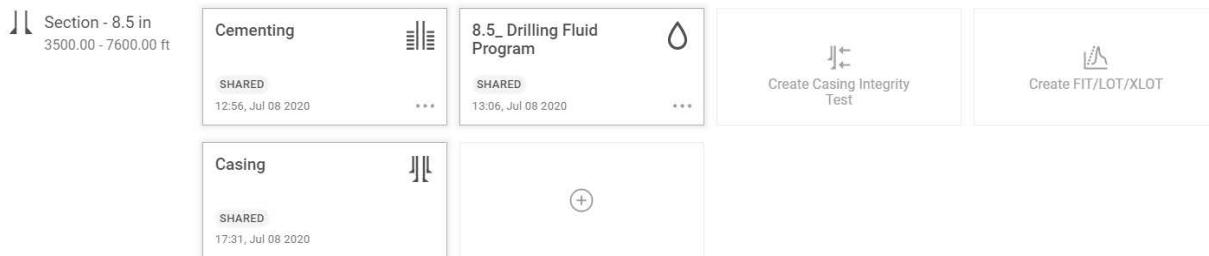
Navigate to the contingency's Plan page and click "Create Cementing"

Update the cement job in the 6.125" hole to have a shoetrack length of 60' and a wait on cement time of 8 hours. Add lead and tail cements to mimic the below snapshot, adjusting the lead length so the top depth for the lead is 4,000'. Make sure to save and share when complete.

NAME	DENSITY (lbm/gal)	LENGTH (ft)	TOP DEPTH (ft RKB)	IS CEMENT
Lead	12.00	6402.22	4000.00	<input checked="" type="checkbox"/>
Tail	15.00	500.00	10402.22	<input checked="" type="checkbox"/>

6.7 Revise the 7" cement job

With the revision of the wellbore geometry, it is necessary to adjust the 7" cement job to return to surface. Therefore, navigate to the contingency's Plan page, and click on the cementing workflow in the 8.5" section.



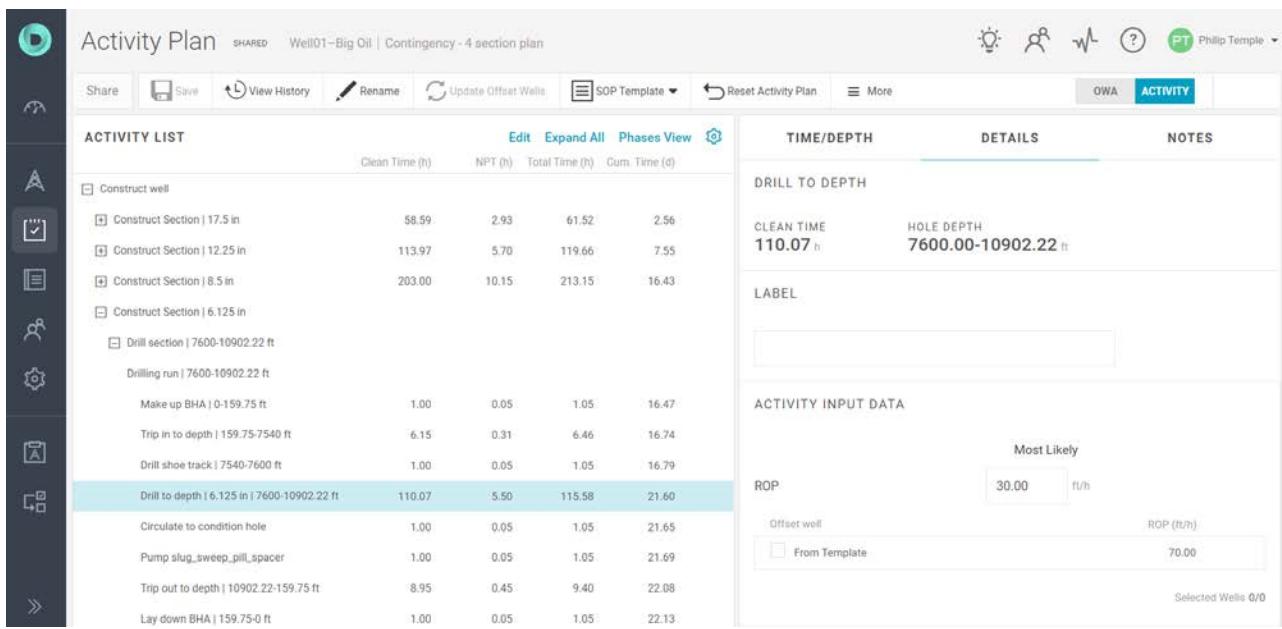
Adjust the lead cement length to bring cement to surface, where the lead top depth is 0'. Once updated, click save and share. The updated cement job should look like the below snapshot.

NAME	DENSITY (lbm/gal)	LENGTH (ft)	TOP DEPTH (ft RKB)	IS CEMENT
Lead	12.00	7100.00	0.00	<input checked="" type="checkbox"/>
Tail	15.00	500.00	7100.00	<input checked="" type="checkbox"/>

6.8 Update the activity plan

Once all the above changes are made, it is now time to re-visit the activity plan to synchronize the plan. Within the contingency plan, navigate to Activity Plan. The Activity Plan will update the changes made above (wellbore geometry and additional cement job); the 6.125" section should be visible once synchronized.

Make sure to update the ROP in the 6.125" section to reflect the production hole drilling speeds. In this example, we'll update 6.125" section ROP to 30'/hr. Once done, click save and share.



The screenshot shows the DrillPlan Activity Plan interface. On the left, there's a sidebar with various icons. The main area has tabs for 'Activity Plan' (selected), 'SOP Template', 'Reset Activity Plan', and 'More'. Below these are sections for 'ACTIVITY LIST' and 'TIME/DEPTH'.

ACTIVITY LIST:

	Clean Time (h)	NPT (h)	Total Time (h)	Cum. Time (d)
Construct well				
Construct Section 17.5 in	58.59	2.93	61.52	2.56
Construct Section 12.25 in	113.97	5.70	119.66	7.55
Construct Section 8.5 in	203.00	10.15	213.15	16.43
Construct Section 6.125 in				
Drill section 7600-10902.22 ft				
Drilling run 7600-10902.22 ft				
Make up BHA 0-159.75 ft	1.00	0.05	1.05	16.47
Trip in to depth 159.75-7540 ft	6.15	0.31	6.46	16.74
Drill shoe track 7540-7600 ft	1.00	0.05	1.05	16.79
Drill to depth 6.125 in 7600-10902.22 ft	110.07	5.50	115.58	21.60
Circulate to condition hole	1.00	0.05	1.05	21.65
Pump slug_sweep_pill_spacer	1.00	0.05	1.05	21.69
Trip out to depth 10902.22-159.75 ft	8.95	0.45	9.40	22.08
Lay down BHA 159.75-0 ft	1.00	0.05	1.05	22.13

TIME/DEPTH:

CLEAN TIME	HOLE DEPTH
110.07 h	7600.00-10902.22 ft

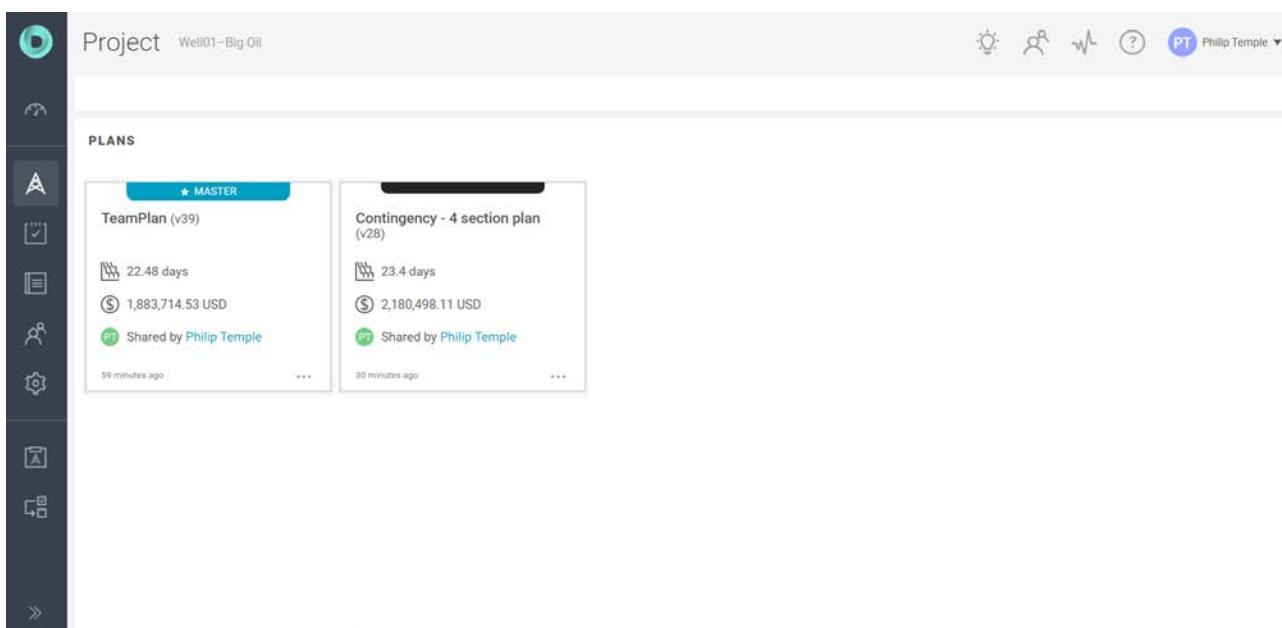
ACTIVITY INPUT DATA:

Most Likely

ROP	ft/h
30.00	ft/h

Offset well: From Template ROP (ft/h): 70.00 Selected Wells 0/0

Finally, we can review the primary and contingency plans on the Project page. The days and AFE may differ slightly due to the differences in trajectory chosen.



The screenshot shows the DrillPlan Project page. On the left, there's a sidebar with various icons. The main area has tabs for 'Project' (selected) and 'Well01-Big Oil'. Below these are sections for 'PLANS'.

PLANS:

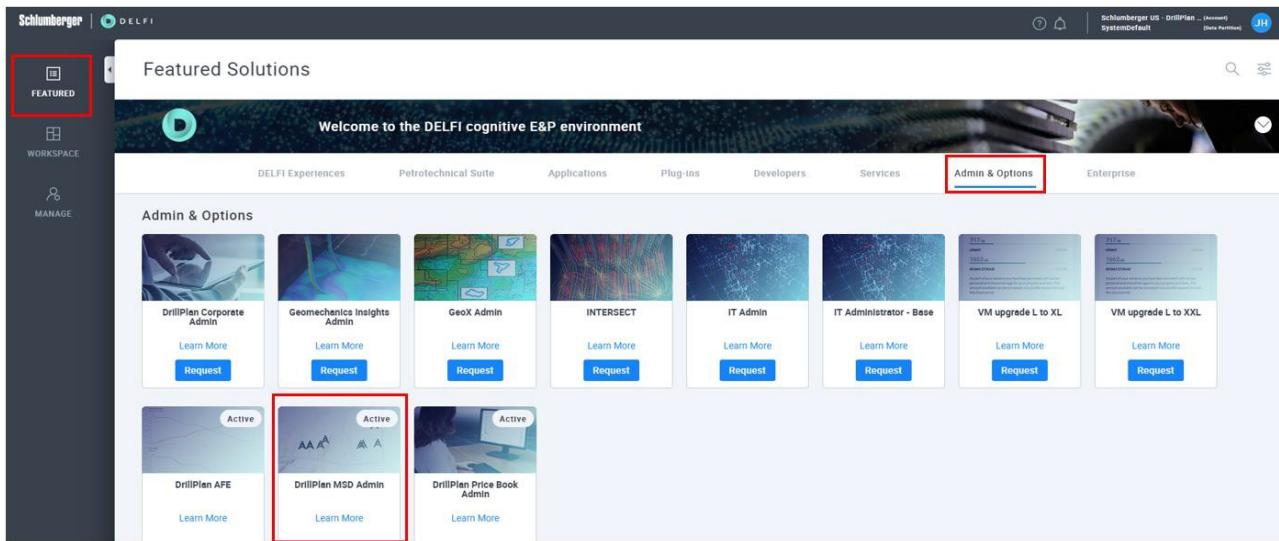
★ MASTER	
TeamPlan (v39)	Contingency - 4 section plan (v28)
22.48 days	23.4 days
\$ 1,883,714.53 USD	\$ 2,180,498.11 USD
Shared by Philip Temple	Shared by Philip Temple
59 minutes ago	30 minutes ago

7 Appendix

7.1 Populating the Master Survey Database (MSD)

In DrillPlan, you can manage your offset well trajectories in the Master Survey Database (MSD). The surveys in the MSD can be used for anti-collision analysis and trajectory re-planning. You can manage the MSD data on the under Survey Management feature.

7.1.1 Request the rights to DrillPlan MSD Admin feature through Delfi page

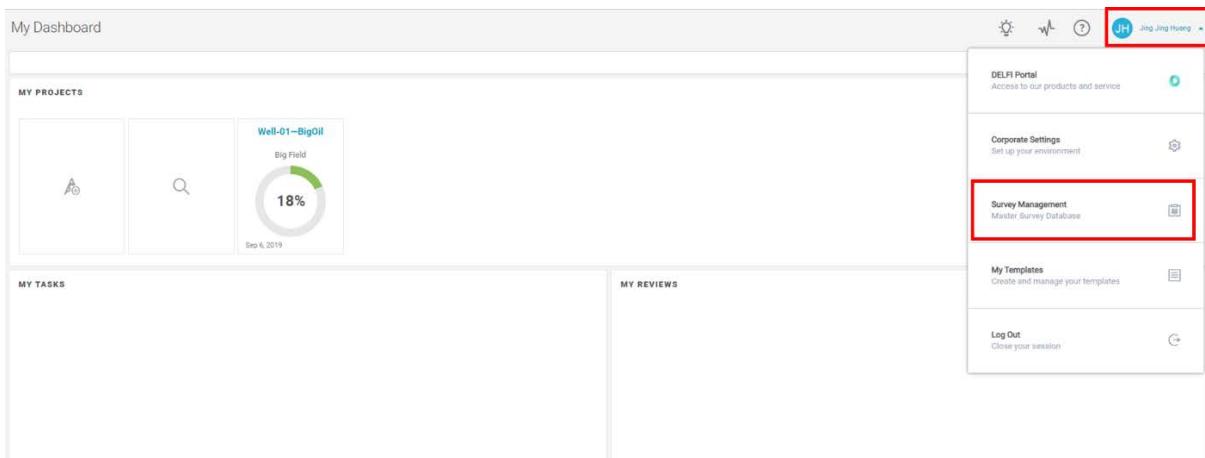


The screenshot shows the DELFI cognitive E&P environment homepage. On the left, there is a sidebar with 'FEATURED' (highlighted with a red box), 'WORKSPACE', and 'MANAGE'. The main content area has a banner 'Welcome to the DELFI cognitive E&P environment'. Below it, there are several tabs: 'DELFI Experiences', 'Petrotechnical Suite', 'Applications', 'Plug-Ins', 'Developers', 'Services', 'Admin & Options' (highlighted with a red box), and 'Enterprise'. The 'Admin & Options' section contains cards for various administrative roles, including 'DrillPlan Corporate Admin', 'Geomechanics Insights Admin', 'GeoX Admin', 'INTERSECT', 'IT Admin', 'IT Administrator - Base', 'VM upgrade L to XL', 'VM upgrade L to XXL', 'DrillPlan AFE', 'DrillPlan MSD Admin' (highlighted with a red box), and 'DrillPlan Price Book Admin'. Each card has 'Learn More' and 'Request' buttons.

7.1.2 Transferring batch surveys through DOX

The following process describe the steps to transfer batch of surveys from DOX (Internal software).

- 1) Open the MSD page by selecting Survey Management from the drop-down options under your profile bar



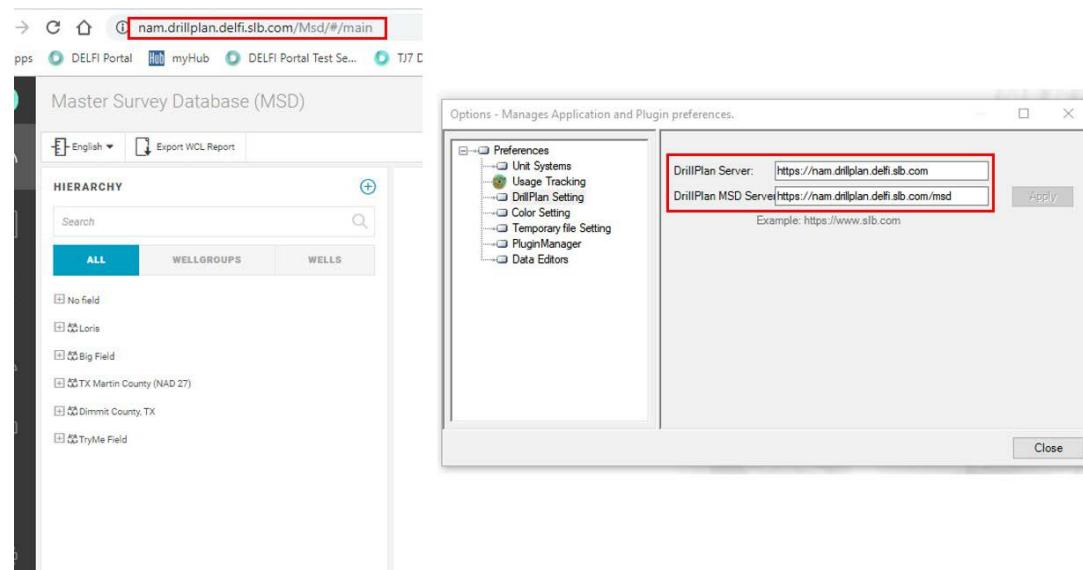
The screenshot shows the 'My Dashboard' page in the 'DELFI Portal'. At the top right, there is a user profile icon with 'Jing Jing Huang' (highlighted with a red box). The dashboard includes sections for 'MY PROJECTS' (with a progress bar for 'Well-01-BigOil' at 18%), 'MY TASKS', 'MY REVIEWS', and a right sidebar. The right sidebar contains links: 'Corporate Settings', 'Survey Management' (highlighted with a red box), 'My Templates', and 'Log Out'.

- 2) Make sure latest Drilling Office X version is in use - Version 2.10.810.1
- 3) Set the DrillPlan setting to the correct DrillPlan server.

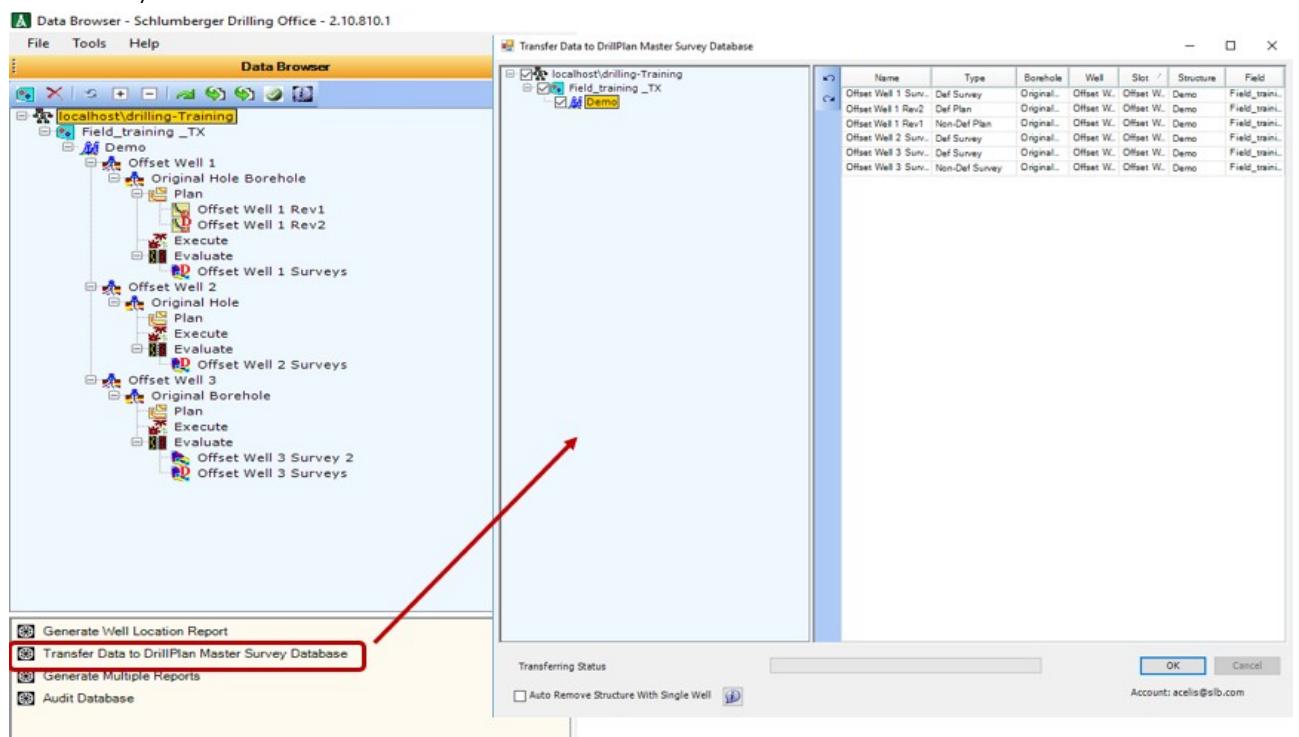
Under Tools -> Options -> DrillPlan Setting -> Take address from Drillplan MSD you are transferring to i.e. for Production Tenant:

DrillPlan server: <https://www.drillplan.slb.com>

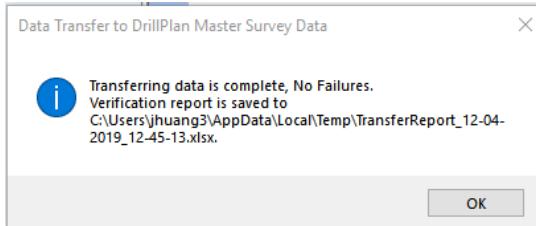
DrillPlan MSD server: <https://www.drillplan.slb.com/msd>



- 4) Select Transfer Data to DrillPlan Master Survey Database, a new window will open -> Select the Structures you want to transfer -> OK



- 5) Follow the prompted authentication and wait for following confirmation



- 6) Refresh the DrillPlan MSD page and you will see the new structure has been transferred over.

7.1.3 Manually load an offset well (with wellbore & survey) to the MSD

The following process describe the steps to create an offset well survey directly in the MSD. This process is only illustrated in this training guide for your knowledge but will not be covered as part of the exercise.

1. You can search for Field, Structure, or Well by typing the name in the search box.

2. Add Structure to a Field

3. The red Asterisk sign * indicates the required information.

NEW STRUCTURE

Structure Name *	<input type="text"/>		Field *	TryMe Field	<input type="button" value="▼"/>
Structure Type *	Land	<input type="button" value="▼"/>	Structure Elevation (above MSL) *	0.00	ft
Coordinate System *	NAD27 Universal Trans...	<input type="button" value="..."/>	North Reference *	Grid North	<input type="button" value="▼"/>
Coordinate Type *	Grid	<input type="button" value="▼"/>	Uncertainty Radius	<input type="text"/> ft	
Northing *	<input type="text"/> ft		Confidence Level	<input type="text"/> sigma	
Easting *	<input type="text"/> ft		Scale Factor	<input type="text"/>	
Latitude	<input type="text"/> deg		Grid Convergence	<input type="text"/> deg	
Longitude	<input type="text"/> deg				

4. Select Add a new well to a Structure

Master Survey Database (MSD)

English Export WGL Report

HIERARCHY 

- All
- WELLGROUPS
- WELLS

TryMe Field 

DrillPlan TryMe  

Big Field

Field_training

DRILLPLAN TRYME

GENERAL

Structure Name	DrillPlan TryMe	Wells	3
Structure Type	Land		
Field	TryMe Field		

COORDINATES

Coordinate Reference System	NAD27 Universal Transverse Mercator, Zone 15 North, US Feet	North Reference	Grid North
Coordinate Type	LOCAL CARTESIAN	Uncertainty Radius	0.00 ft
Northing	12869911.47 ftUS	Confidence Level	3.00 sigma
Easting	1746300.86 ftUS	Scale Factor	1.00
Latitude	39°26'58.3594"N	Grid Convergence	0.21 deg
Longitude	92°38'39.7558"W		

ELEVATION

Structure Elevation (above MSL)	0.00 ft
---------------------------------	---------

5. The red Asterisk sign  indicates the required information under each tab. On the **General** tab, enter the required general well data, such as the Well Name, Field, and Operating Company.

ADD WELL

GENERAL **COORDINATES** **ELEVATION**

Well Name *		Country	UTM - NAD27 in feet
Field *	TryMe Field	Area	
Structure	DrillPlan TryMe	State/Province	
Operating Company *		County	
Well Type		City	
Well Purpose		Location Code	

This well is assigned to a structure, some properties are defined by the structure and not editable. [Unassign](#)

Cancel **OK**

6. On the Coordinates tab, enter the required coordinates data, such as the Coordinate System, Coordinate Type, Northing/Easting or Latitude/Longitude data, and the North Reference

ADD WELL

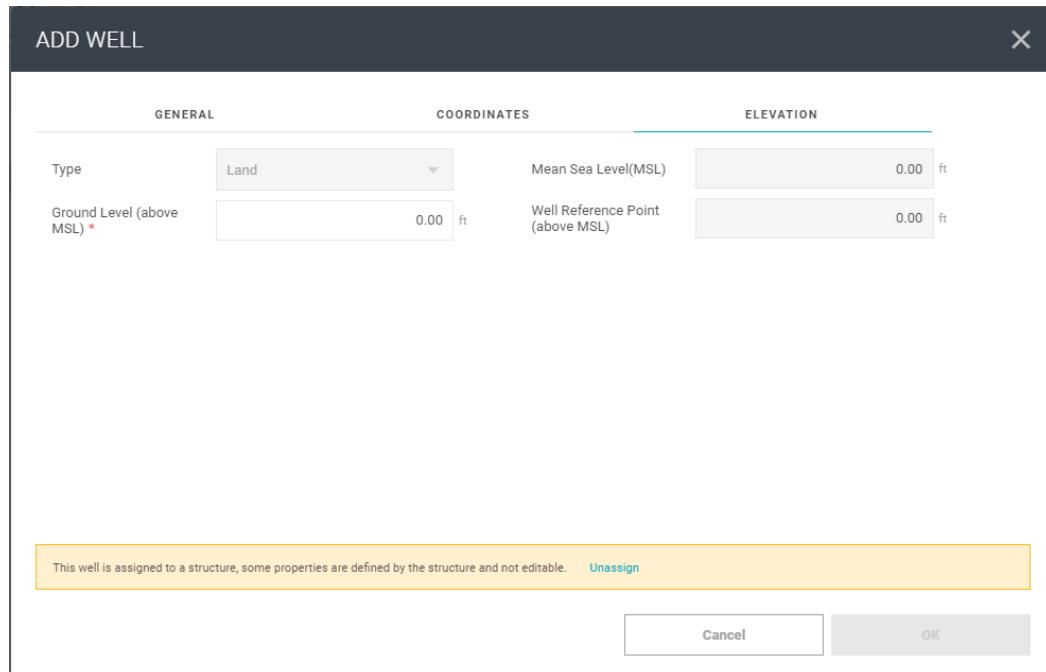
GENERAL **COORDINATES** **ELEVATION**

Coordinate System *	NAD27 Universal Transver...	Northing *	ft
Coordinate Type *	Grid	Easting *	ft
North Reference *	Grid North	Latitude *	— deg
Uncertainty Radius	ft	Longitude *	— deg
Confidence Level	sigma	N/S *	ft
Scale Factor		E/W *	ft
Grid Convergence	deg	Distance *	ft
		Azimuth *	deg

This well is assigned to a structure, some properties are defined by the structure and not editable. [Unassign](#)

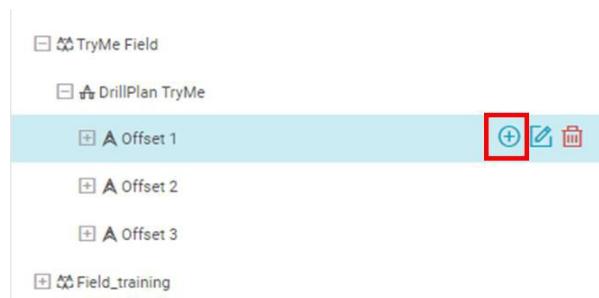
Cancel **OK**

7. On the Elevation tab, enter the required data and then, select OK



The screenshot shows the 'ADD WELL' dialog box with the 'ELEVATION' tab selected. The 'Type' field is set to 'Land'. In the 'Ground Level (above MSL)*' section, the value is '0.00 ft'. In the 'Mean Sea Level(MSL)' section, the value is '0.00 ft'. In the 'Well Reference Point (above MSL)' section, the value is '0.00 ft'. A note at the bottom of the dialog box states: 'This well is assigned to a structure, some properties are defined by the structure and not editable.' with a blue 'Unassign' link. At the bottom right, there are 'Cancel' and 'OK' buttons, with 'OK' being highlighted.

8. Select the Well in the Hierarchy pane and select  Add new wellbore on the right side of the well



9. On the **Add Wellbore** dialog box fill out required information. Wellbore can be made a sidetrack by toggling **Sidetrack Wellbore** on, and you can select a **Parent Wellbore**.

ADD WELLBORE

Wellbore Name *	<input type="text"/>
Sidetrack Wellbore	<input checked="" type="checkbox"/>
Parent Wellbore *	Offset 1
Wellbore Status	<input type="text"/>
API#	<input type="text"/>
UWI#	<input type="text"/>
Business System	Job Number
Job Number	<input type="text"/>
Cancel OK	

10. Under Wellbore, in the Survey List pane, select  Create or Add Survey

Master Survey Database (MSD)

English Export WCL Report

HIERARCHY

- ALL
- WELLGROUPS
- WELLS
- TryMe Field
- DrillPlan TryMe
- Offset 1
- Offset 2
- Offset 3
- Big Field
- Field_training

OFFSET 1

GENERAL

Wellbore Name	Offset 1	API#
Parent Wellbore	-	UWI#
Wellbore Status	-	Job Number
Boundary	0	

SURVEY LIST

SURVEY NAME	SURVEY TYPE	WELLBORE	WELL	STRUCTURE	WELL GROUP	CREATION DATE	MODIFIED DATE

 No data
Add Survey

11. Add Survey, Fill out required .

Add Survey

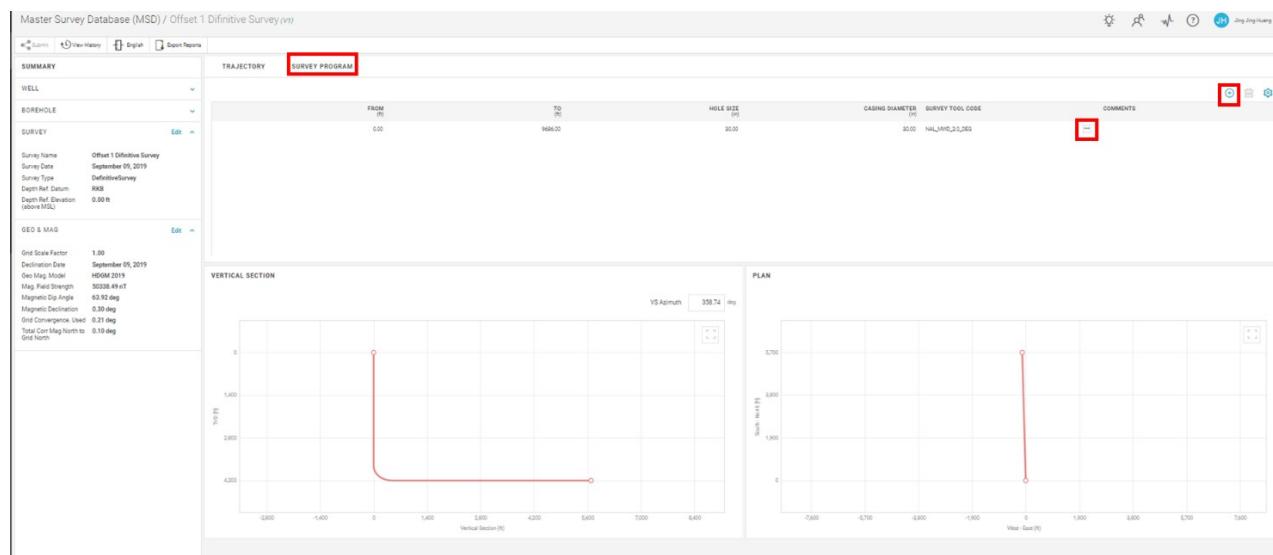
Survey Name *	New Survey
Survey Date *	Sep 9, 2019
Survey Type *	DefinitiveSurvey
Rotary Kelly Bushing (above Ground Level) *	0.00 ft
<input type="button" value="Cancel"/> <input type="button" value="OK"/>	

12. Choice of Import Survey or Paste in Survey. Import Survey imports .csv files. Paste takes MD, Inclination, and Azimuth columns and will calculate the rest of the columns.

Master Survey Database (MSD) / Offset 1 Difinitive Survey (*not submitted*)

SUMMARY		TRAJECTORY		SURVEY PROGRAM			
WELL	BOREHOLE	SERIAL NUMBER	MD (ft)	INCL (deg)	GRID AZIMUTH (deg)	TVF (ft)	NS (ft)
SURVEY						EW (ft)	DLS (deg/100ft)
						COMMENT	
Survey Name: Offset 1 Difinitive Survey Survey Date: September 09, 2019 Survey Type: DefinitiveSurvey Depth Ref. Datum: RKB Depth Ref. Elevation (above MSL): 0.00 ft							
GEO & MAG Grid Scale Factor: 1.00 Declination Date: September 09, 2019 Geo Mag. Model: HDGM 2019 Mag. Field Strength: 50338.49 nT Magnetic Dip Angle: 63.92 deg Magnetic Declination: 0.30 deg Grid Convergence: 0.21 deg Total Corr Mag North to Grid North: 0.10 deg							
No Survey Stations <input type="button" value="Import Survey"/> <input type="button" value="Import"/>							
<input type="checkbox"/> The last point is project to bit							
VERTICAL SECTION				PLAN			

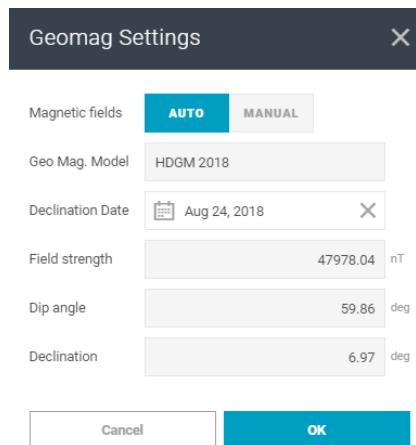
13. After the surveys are imported or pasted, **Survey Program** needs to be filled out to cover total depth. Select **Add New Row** to add a new row to the survey program table, and then enter the depth range (**From** and **To**), **Hole Size**, and **Survey Tool Code**. Default survey Tool Code is NAL_MWD_2.0_DEG. Click on the to browse through Tool Code catalogue.



14. Optional: In the Summary pane, select Edit in the Geo & Mag area to view or edit the geomagnetic model settings



The Geomag Settings dialog box appears. By default, the settings are in the Auto mode and the default geomagnetic model is used. To manually edit the geomagnetic data, select Manual, enter the Field Strength, Dip Angle, and Declination and then select OK.

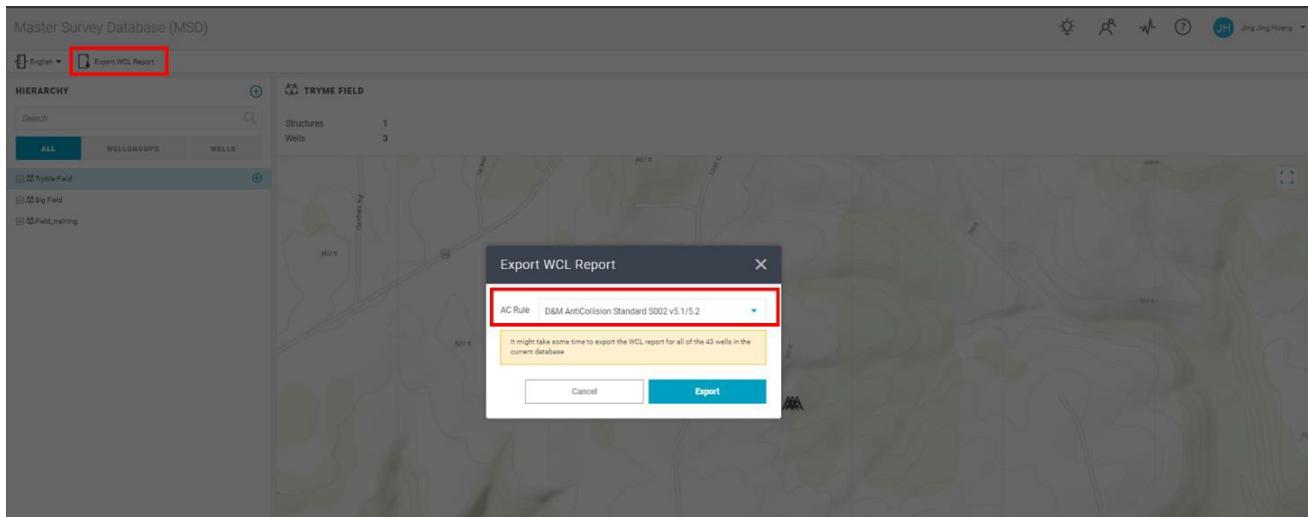


15. To ensure the highest level of accuracy in the wellbore placement, you can export a well coordinate log (WCL) report in the CSV format on the Master Survey Database page.

You can use the WCL report to validate whether the following data are correct:

- The survey data that is imported or manually inputted
- The coordinates for the surface hole location (SHL)
- The attributes and uncertainties of the bottom hole location (BHL)

On the Master Survey Database page, on the command bar, select  Export WCL Report, select the AC Rule and select Export.



The WCL CSV file is then exported. This file includes the following data:

- Wellname: Well Name
- Wellbore: Wellbore Name
- WRPMD: MD@WRP
- WRPTVDSS: TVDSS@WRP, TVDSS references to MSL (TVDSS = 0@MSL, downward is positive)
- Northing: Northing coordinate of SHL
- Easting: Easting coordinate of SHL
- BHMD: MD@BHL, Equivalent to TD
- BHTVDSS: TVDSS@BHL, TVDSS references to MSL (TVDSS = 0@MSL, downward is positive)
- BHNS: NS@BHL, SHL is the origin of NS axis
- BHEW: EW@BHL, SHL is the origin of EW axis
- BHMapN: Northing coordinate of BHL
- BHMapE: Easting coordinate of BHL
- BHEH: Ellipsoid Highside axis length of BHL
- BHEL: Ellipsoid Lateral axis length of BHL
- BHEA: Ellipsoid Alonghole axis length of BHL
- BHBH: Ellipsoid Highside bias of BHL
- BHBL: Ellipsoid Lateral bias of BHL
- BHBA: Ellipsoid Alonghole bias of BHL

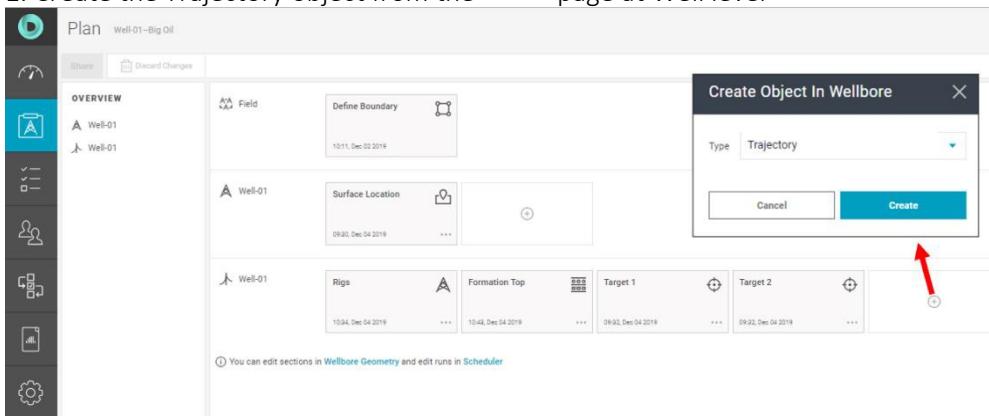
Note: The time needed to export the WCL report depends on how many wells are in the database. If you select Stop during exporting, the report will be incomplete.

7.2 Trajectory Design

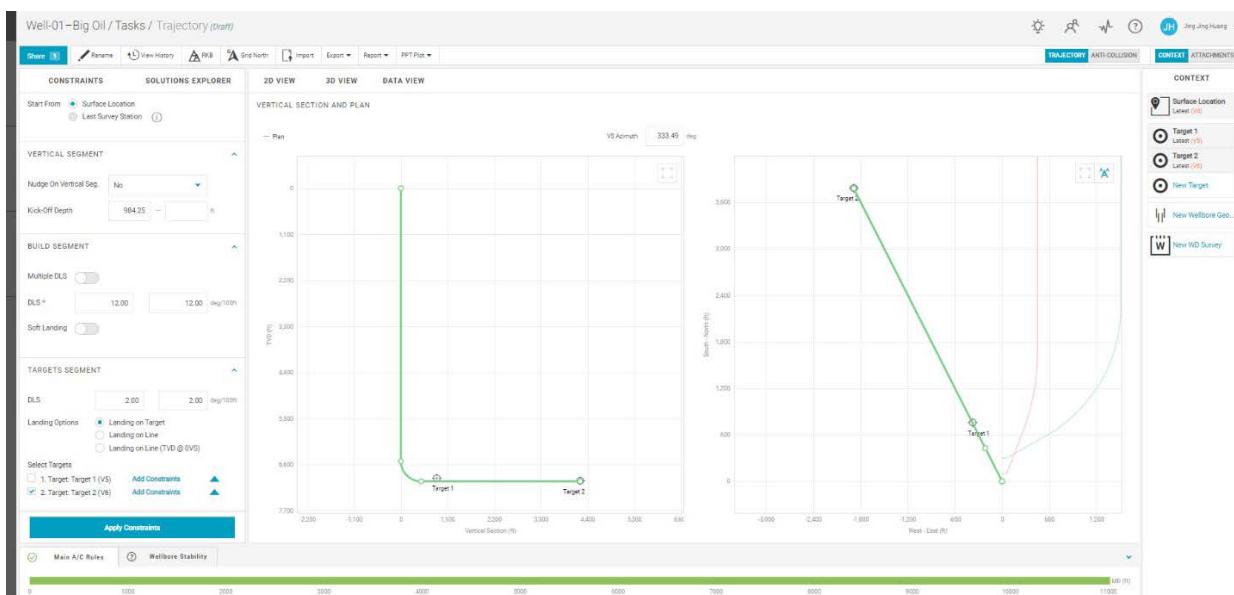
To create an automated trajectory, you need the following data (context) in DrillPlan:

- Surface location
- Target(s)

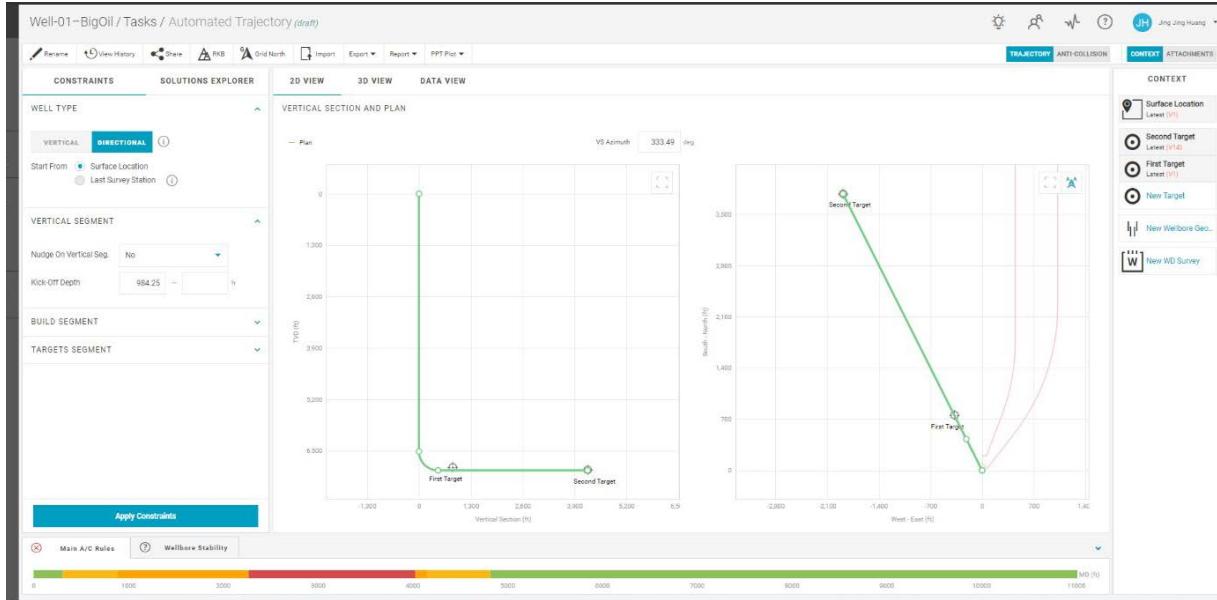
1. Create the Trajectory object from the  page at Well level



9. Initial Automated Trajectory will default with 12°/100ft DLS hitting the farthest target. Additionally, the system automatically triggers the anti-collision analysis with all the offset wells available in the master survey database



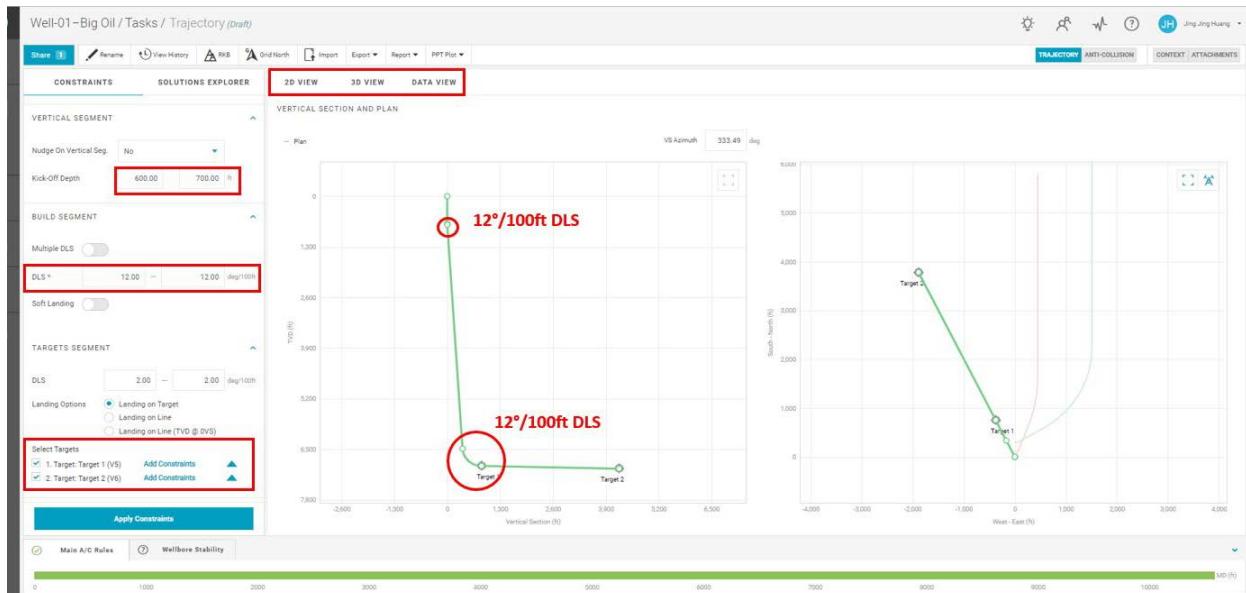
10. The Trajectory page opens. An automated trajectory is created based on the surface location, targets, and default 12°/100ft DLS. Additionally, the system automatically triggers the anti-collision analysis with all the offset wells available in the master survey database



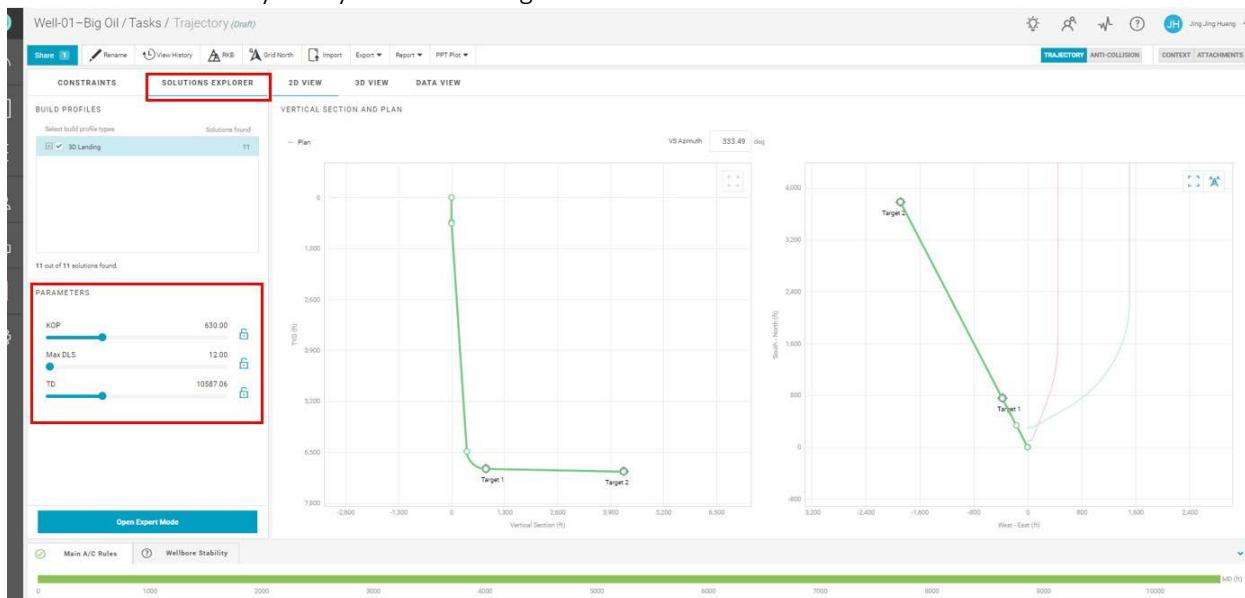
11. On the Constraints pane, the users can adjust different parameters as required for the trajectory design

You can make changes to better find the trajectory and to meet any specific user requirement

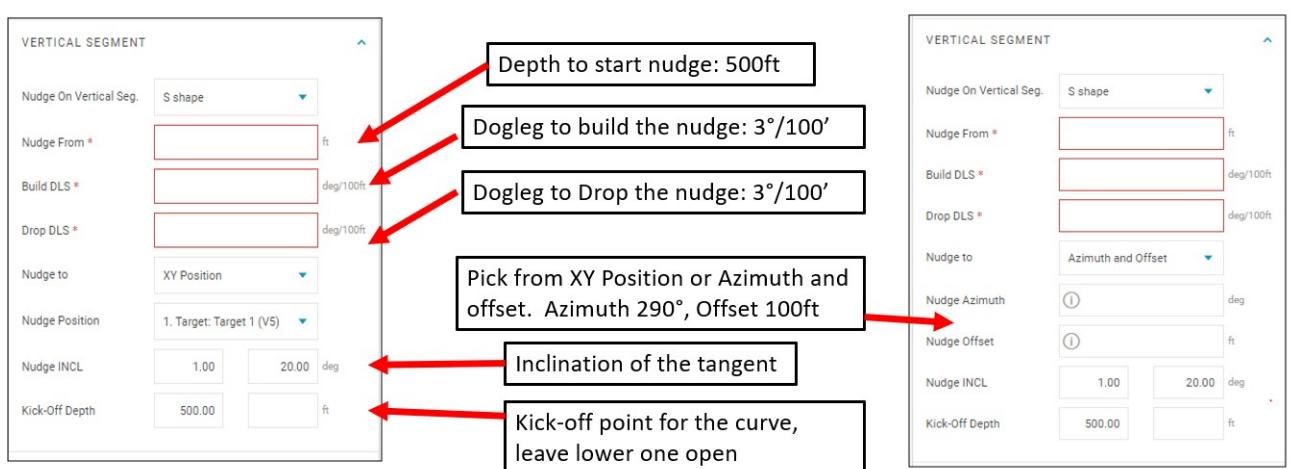
12. Try changing the Kick Off depth to 600-700 ft, and landing on both targets. then click apply constraint. Look to your 2D view and notice the kick off change to within the defined depth. Can click on 3D view and Data view for alternative visual.



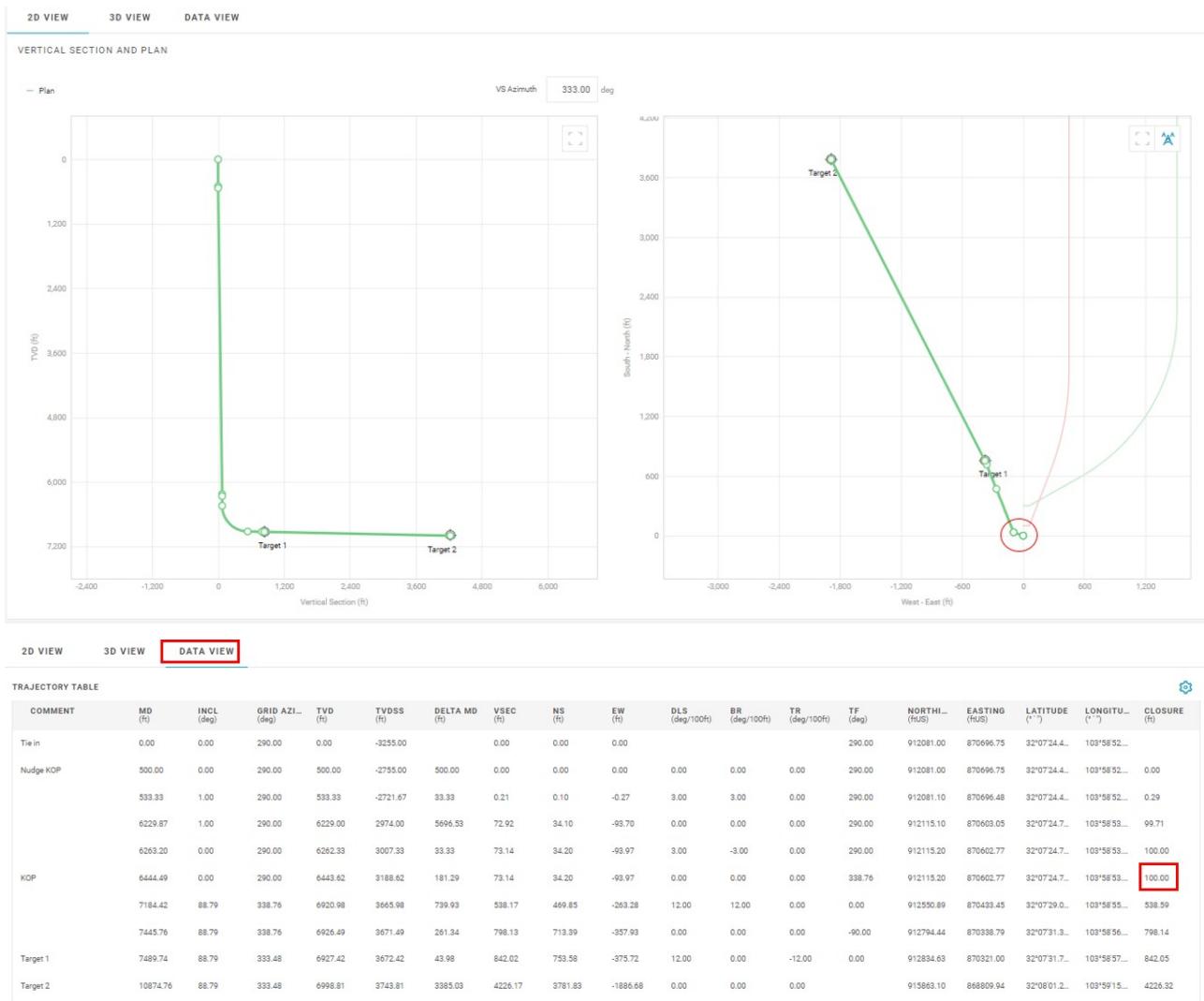
13. You can switch to the Solutions Explorer tab and there you will have the total number of numerical solutions found by the system with the given constraints.



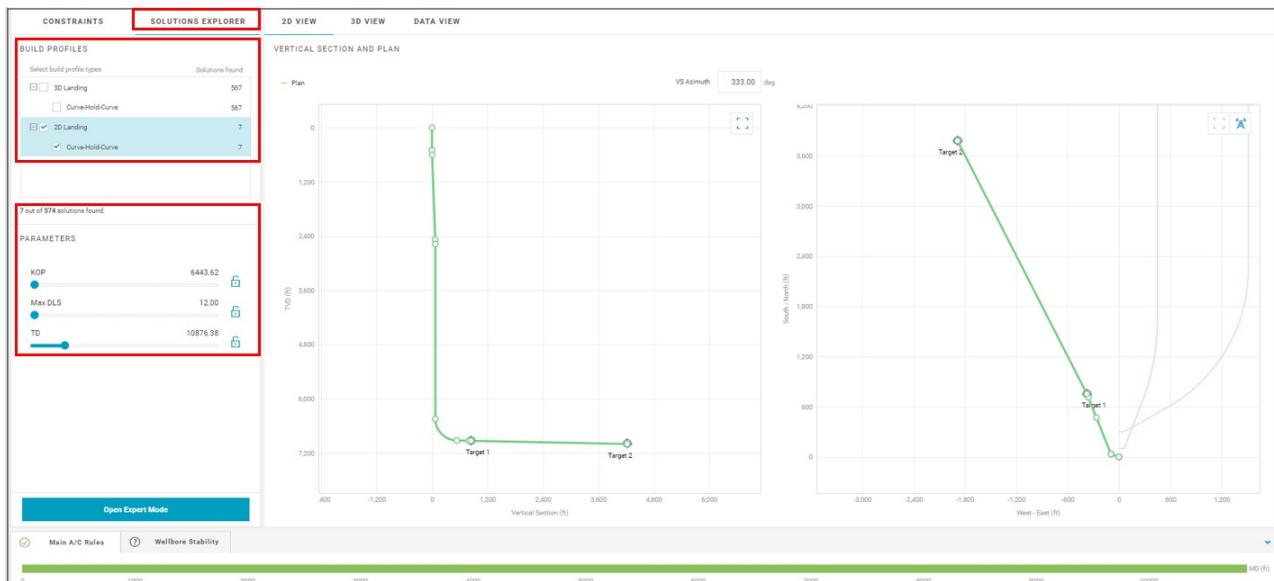
14. If there is a need for a S- type nudge in the vertical section go back in Constraint panel. Select Sshape in the nudge on vertical seg. The red boxes requires user input.



15. Input the values as seen in the image below and observe the 2D view birds eye window. Notice the nudge offsets by 100ft in a 290-degree azimuthal direction. The data view will show that the trajectory nudged in the 290° direction to a closure of 100ft.



16. Again, use Solutions Explorer to explore the different solutions. Use the different profiles to filter the solutions. Then scroll through the desired parameters.

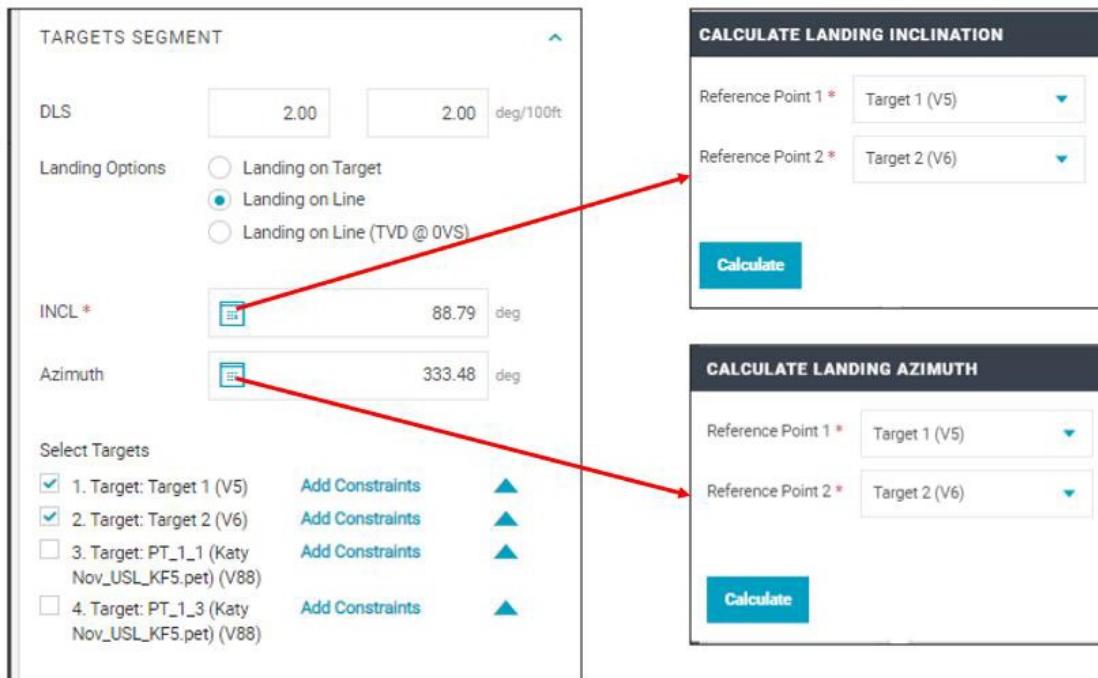


6.2.1.1 Target Segments

Three options are available to specify the landing options:

- Landing on the first target:
The user can specify that the trajectory can land straight on the first target, specifying the inclination and the azimuth of the entry point
- Landing on a line
Users must specify the inclination and the azimuth of the landing line that will go through the first target
- Landing on the Line (TVD@0VSec):
This option is a special case of the option 3 where the user must specify the intersection at the TVD of the vertical intersection

1. Go back to the No-nudge trajectory. Set specific Kick-off Depth 2000ft – 2000ft. Now in target select Landing Option – Landing on Line. Also select to hit both targets.



TARGETS SEGMENT

DLS 2.00 2.00 deg/100ft

Landing Options Landing on Target Landing on Line Landing on Line (TVD @ OVS)

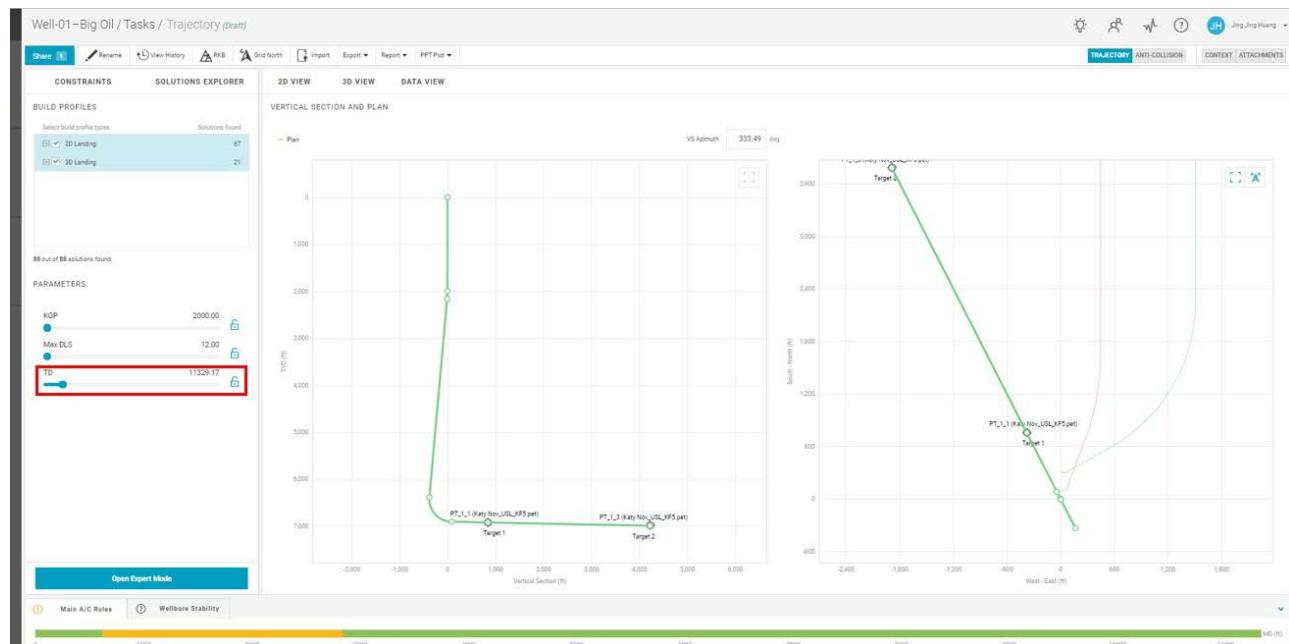
INCL * 88.79 deg

Azimuth 333.48 deg

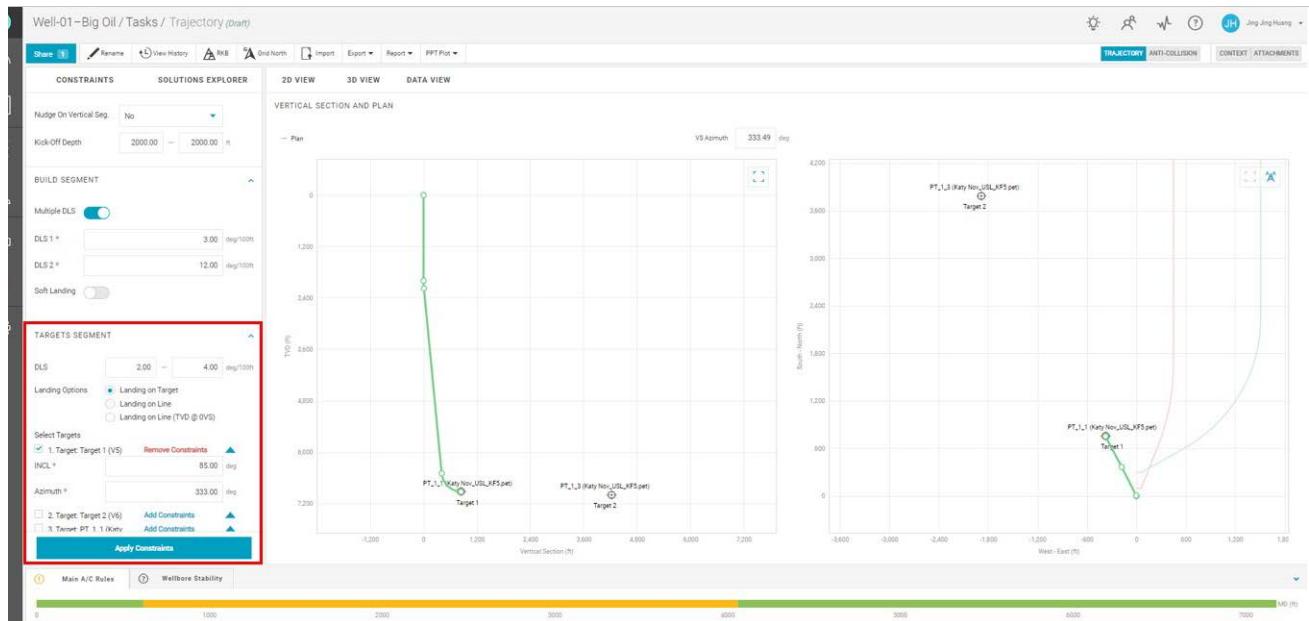
Select Targets

- 1. Target: Target 1 (V5) Add Constraints
- 2. Target: Target 2 (V6) Add Constraints
- 3. Target: PT_1_1 (Katy Nov_USL_KF5.pet) (V88) Add Constraints
- 4. Target: PT_1_3 (Katy Nov_USL_KF5.pet) (V88) Add Constraints

Scroll through the solutions for trajectory with negative section that will still land on the same dip and azimuth desired.

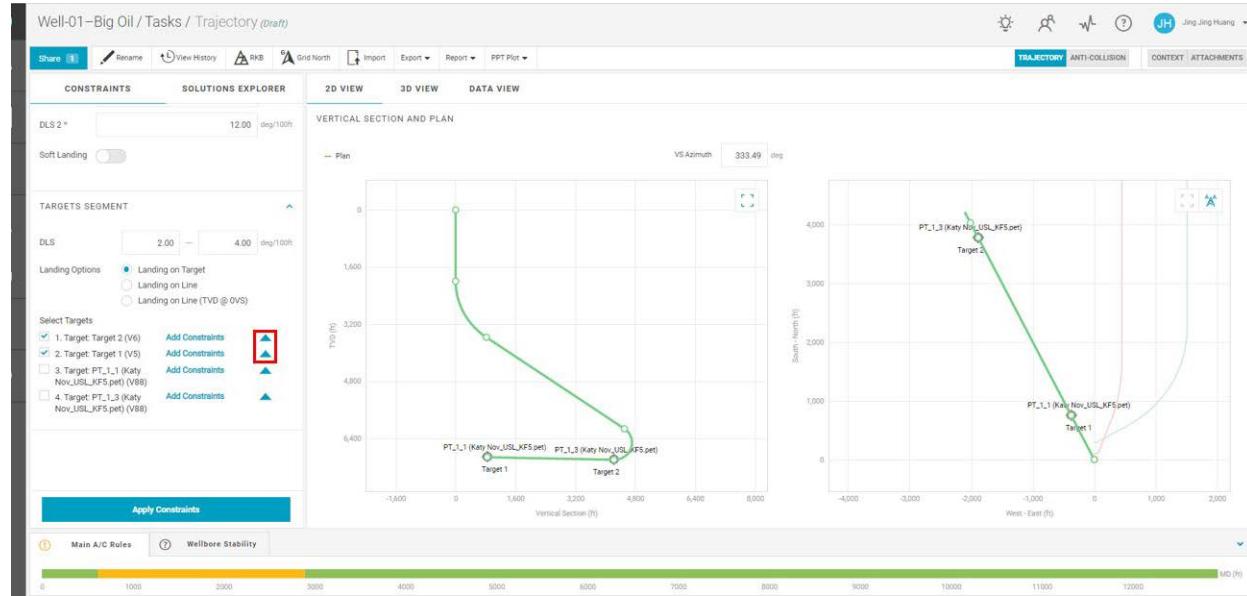


2. Select Add Constraints on the first target and uncheck the second target. Select an inclination to 85 degrees and azimuth to 333 degrees. Notice the trajectory hits the target side on



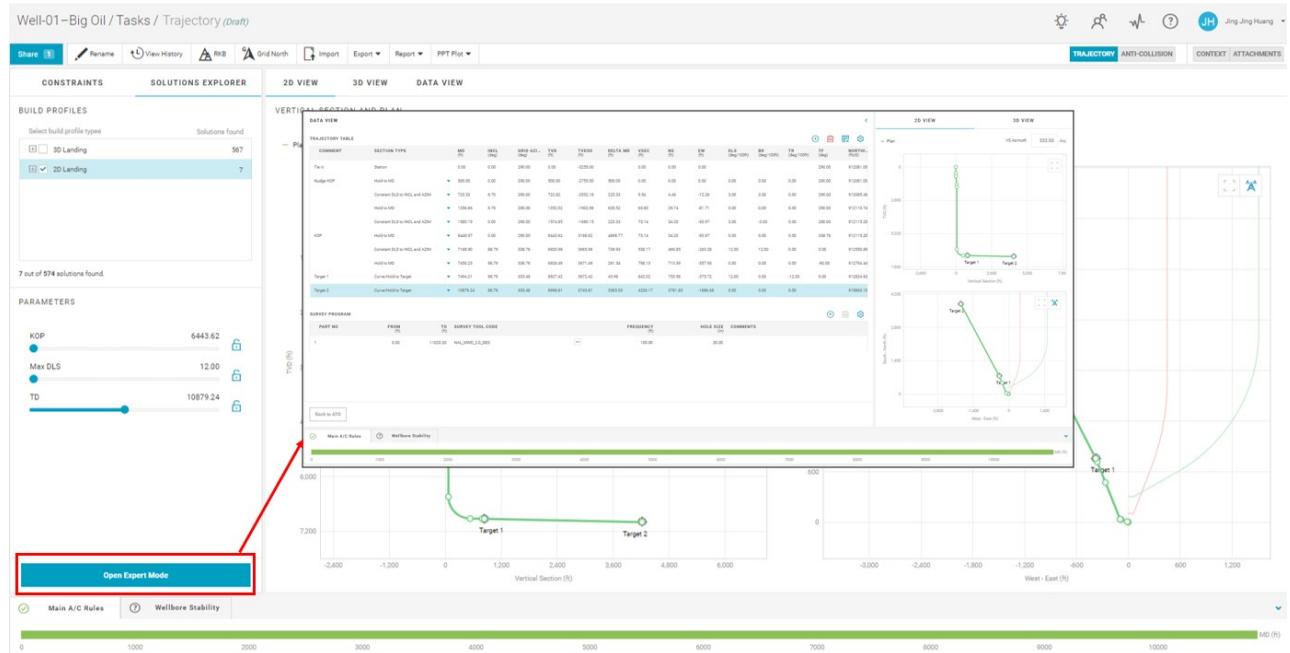
2D VIEW		3D VIEW		DATA VIEW		TRAJECTORY TABLE											
TRAJECTORY TABLE																	
COMMENT	MD (ft)	INCL (deg)	GRID AZI... (deg)	TVD (ft)	TVDS (ft)	DELTA MD (ft)	VSEC (ft)	NS (ft)	EW (ft)	DLS (deg/100ft)	BR (deg/100ft)	TR (deg/100ft)	TF (deg)	NORTH... (ftUS)	EASTING (ftUS)		
Tie in	0.00	0.00	333.95	0.00	-3255.00	0.00	0.00	0.00	0.00	333.95	0.00	0.00	0.00	912081.00	870696.75		
KOP	2000.00	0.00	333.95	2000.00	-1255.00	2000.00	0.00	0.00	0.00	0.00	0.00	0.00	333.95	912081.00	870696.75		
	2176.40	5.29	333.95	2176.15	-1078.85	176.40	8.14	7.31	-3.58	3.00	3.00	0.00	333.95	912088.31	870693.17		
	6514.55	5.29	333.95	6495.80	3240.80	4338.15	408.24	366.77	-179.32	0.00	0.00	0.00	333.00	912447.79	870517.42		
Target 1	7178.78	85.00	333.00	6927.42	3672.42	664.24	842.05	753.58	-375.72	12.00	12.00	-0.14	912834.63	870321.00			

3. Select both Targets. Use the arrows to change the order, making target 2 appear first and remove the target specific constraints to the target. Then select apply constraints on the bottom. Notice now the ATD hits the target 2 first and then the target 1. The order of the targets in DrillPlan is therefore critical for the correct trajectory calculation

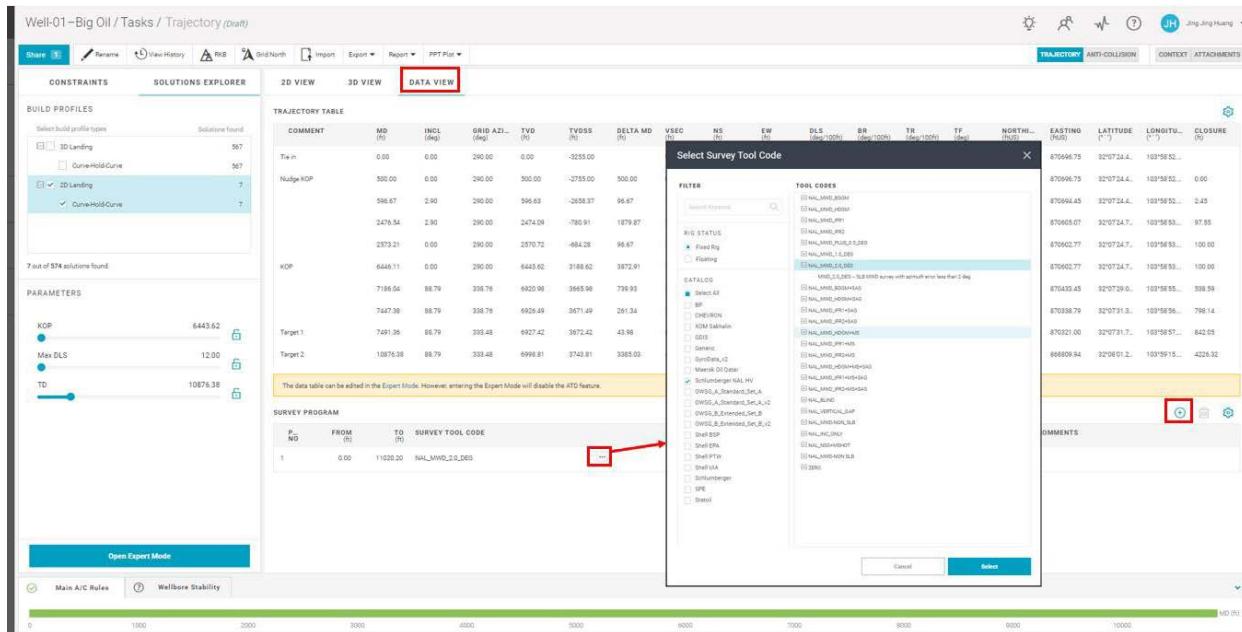


6.2.1.2 Expert Mode

- If the solution can not be found in ATD then user can Open Expert Mode. Expert mode enable user to add to a ATD trajectory or start from scratch using Hold, Curve, and an array of profiles. Start by clicking on Open Expert Mode in Solution Explorer tab.



- To put in or change tool-codes. Go to the Data view.  allows user to put in multiple sections of depth. Click on the  next to the Survey Tool Code will open the tool code catalogue allowing.



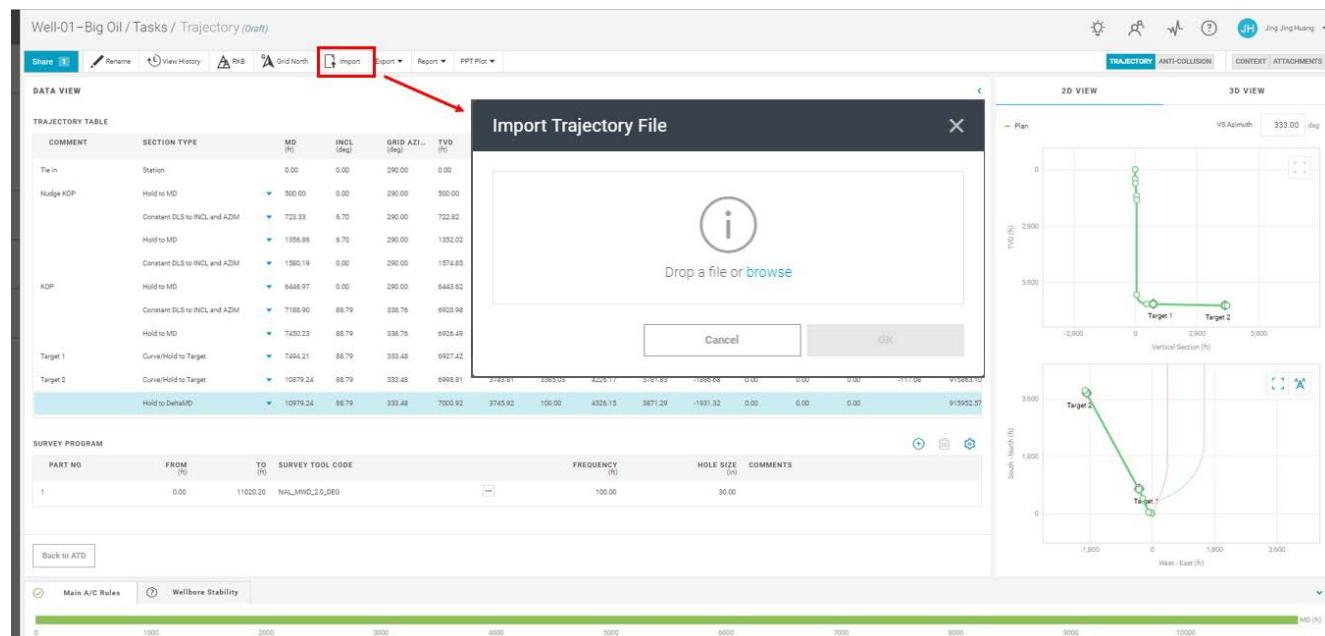
The screenshot shows the DrillPlan software interface for the 'Trajectory' module. The 'DATA VIEW' tab is active. On the left, there's a 'BUILD PROFILES' section with two profiles: '3D Landing' and 'Curve-Hold/Curve'. Below it, a table shows '7 out of 574 solutions found' for 'Nudge KOP'. The 'PARAMETERS' section includes 'KOP' (6443.62), 'Max DLS' (12.00), and 'TD' (10876.38). The 'SURVEY PROGRAM' section shows a table with one row: P_NO 1, FROM 0.00, TO 11020.20, and SURVEY TOOL CODE NAL_MWD_10_DEG. A red box highlights the '...' button next to the SURVEY TOOL CODE column. A modal window titled 'Select Survey Tool Code' is overlaid, listing survey tool codes like 'NAL_MWD_000H' and 'NAL_MWD_000H40'. A red box highlights the 'Select' button at the bottom right of the modal.

- When the trajectory meets all design criteria, remember to Share to make the trajectory available to the team (as well as the other engines)
- Once shared, the Complete button will appear, remember to click on it to trigger the Review/Approve process

7.2.1 Import Trajectory

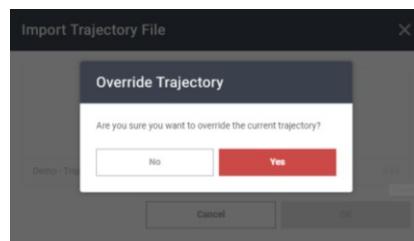
In addition to creating automated trajectories from scratch, DrillPlan also provides the tools to import trajectories from widely accepted industry data standards. The following steps will walk through this process:

- Select  and browse for the Demo – Trajectory.csv file or drag and drop. It can import .csv and .xml formats.

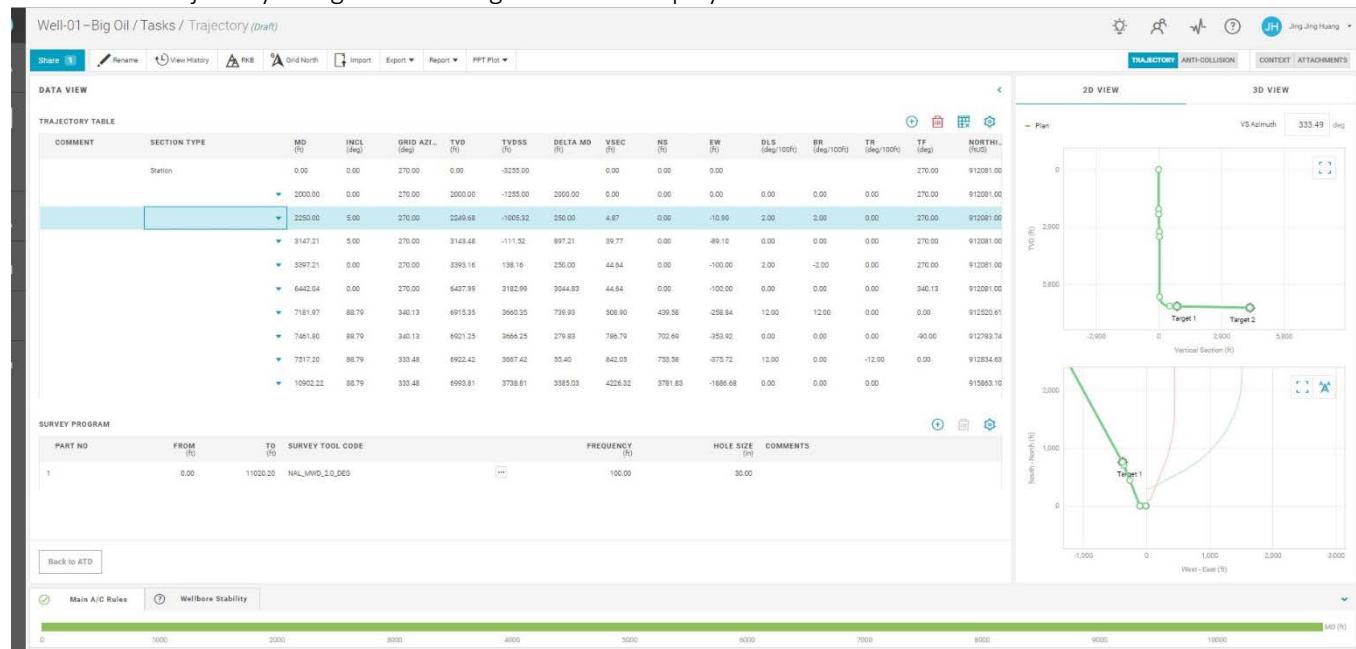


The screenshot shows the DrillPlan interface for Well-01-Big Oil / Tasks / Trajectory (Draft). The top navigation bar includes Share, Rename, View History, RNB, Grid North, Import (highlighted with a red box), Export, Report, PPT Plot, and a user profile for Jing Jing Huang. Below the navigation bar is a 'DATA VIEW' section containing a 'TRAJECTORY TABLE' and a 'SURVEY PROGRAM'. The 'TRAJECTORY TABLE' lists various sections like Tie-in, Nudge KOP, KOP, Target 1, and Target 2 with their respective coordinates and parameters. The 'SURVEY PROGRAM' table shows survey tool code and frequency. To the right are '2D VIEW' and '3D VIEW' windows displaying the well trajectory plan and vertical section plots.

2. A warning message to Override might come up. Select Yes



3. The trajectory along with the targets 1 and 2 display on the 2D and 3D windows



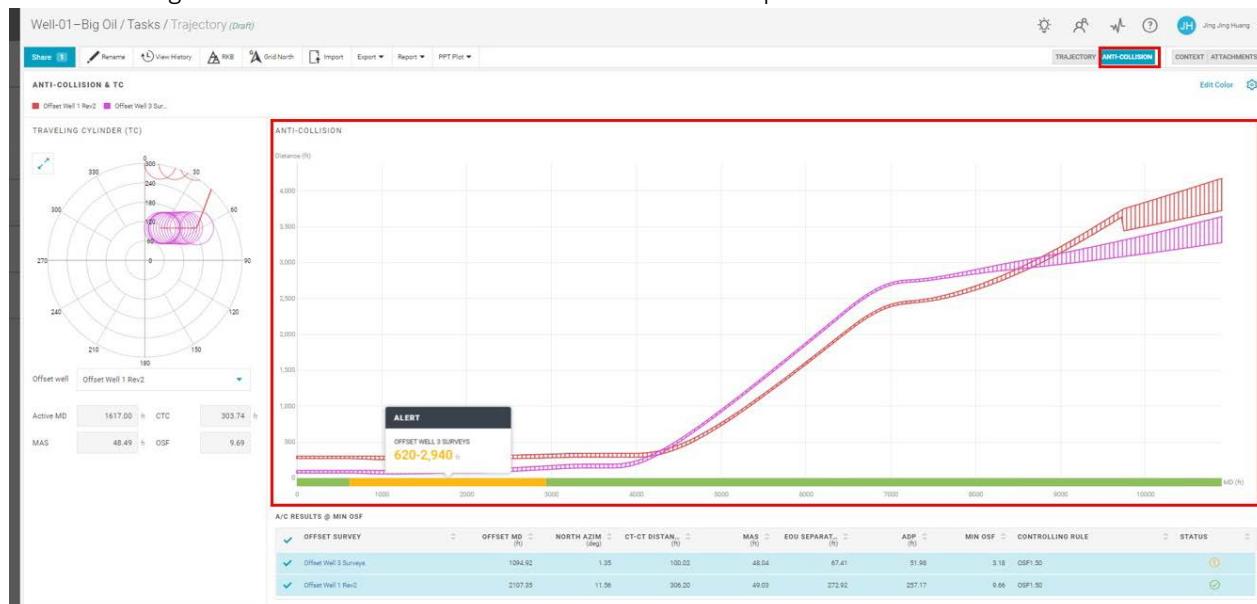
The screenshot shows the DrillPlan interface after overriding the trajectory. The 'TRAJECTORY TABLE' now includes the new sections added during the override process. The '2D VIEW' and '3D VIEW' windows show the updated trajectory path, which now includes the segments defined in the 'Trajectory Table' and the two targets marked on the plots.

4. At this stage users can edit the imported trajectory if necessary, using the built-in features within DrillPlan. The trajectory imports as survey stations you can edit the section type at each station.
5. Input Survey Program per trajectory requirements.
6. Remember to Share, select Complete and set the progress bar accordingly

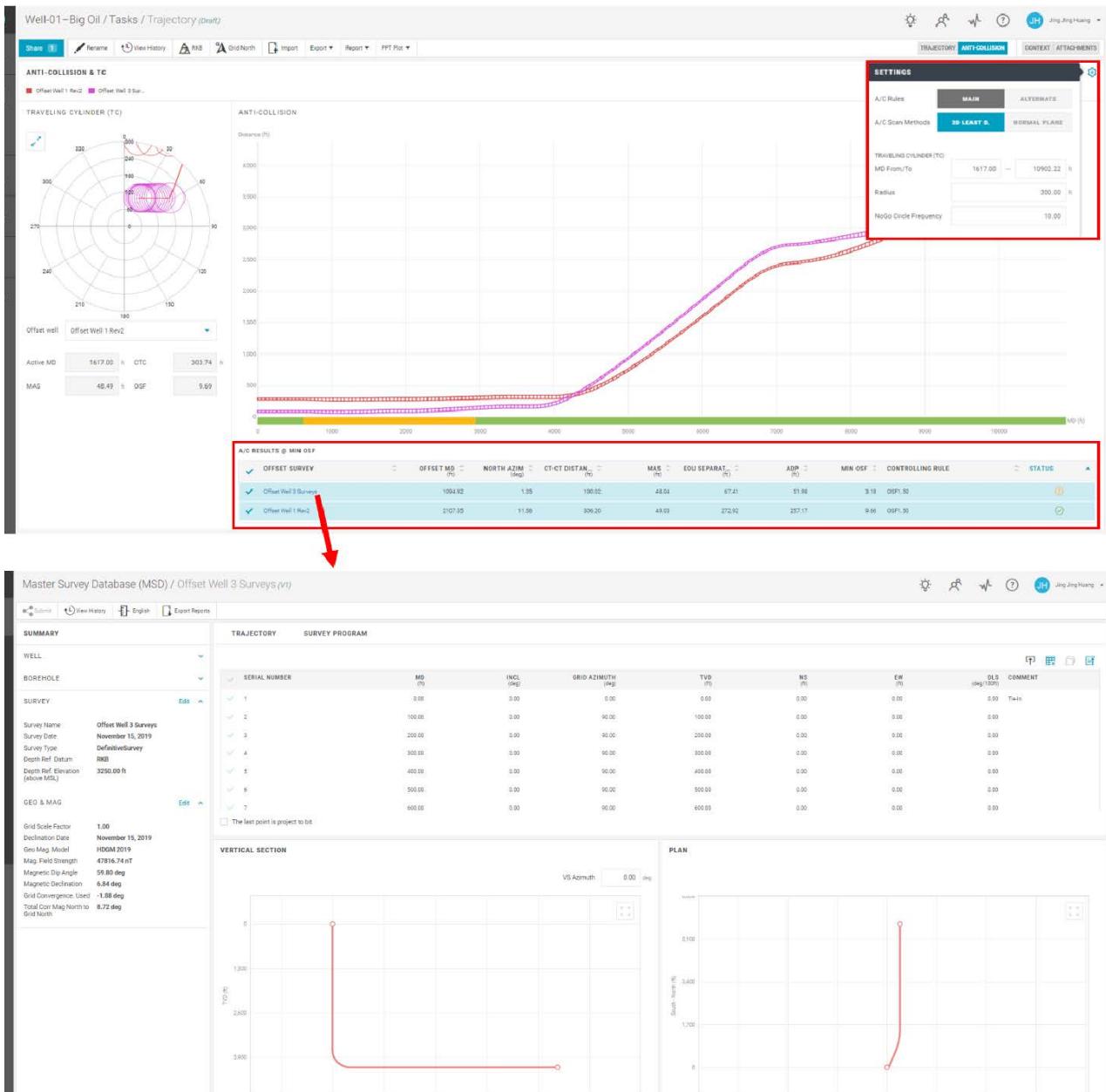
7.2.2 Anti-Collision

After the trajectory and Survey Program is entered in trajectory. Offset well surveys are populated in MSD. Anti-collision will always run in the background whenever there is a change to trajectory. You can look at Anti-collision in detail in the Anti-collision tab. It has 3 parts.

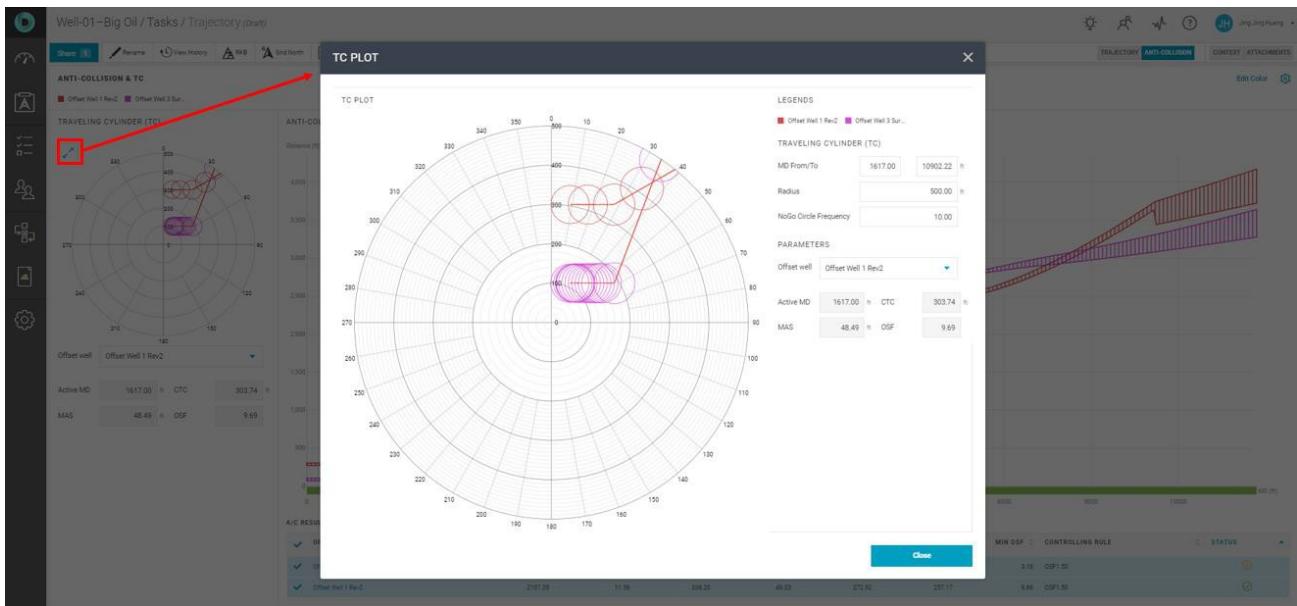
1. The ladder plot showing the offset wells against a chart MD vs Distance from subject well. The bar underneath is color coded to AC Statues. Red is Fail major, Dark Orange is Fail Minor, Light Orange is Warning and Green is Pass. Bar is clickable to show the depth interval.



2. The Anti-Collision Results summary result. User can arrange by Status, CT-CT Distance, Min OSF, ADP, etc by clicking on the element you want to arrange it by. The Offset Surveys are also clickable and will take the survey links to MSD. If it is a trajectory associated with a Drillplan project it will link to the project. User can choose from 2 different scans in Settings, 3D Least Distance or Normal Plane. On the bottom is the summary of AC with the offset surveys listed by Statues order. Can also generate a AC Summary, AC detailed, EOU, etc reports from the report tab.



3. The Traveling Cylinder Plot shows subject well as a tunnel with offset well cross it's Radius. User can use settings to set specific depth range, Radius of interest, and NoGo Circle frequency. TC Plot can also be popped out.

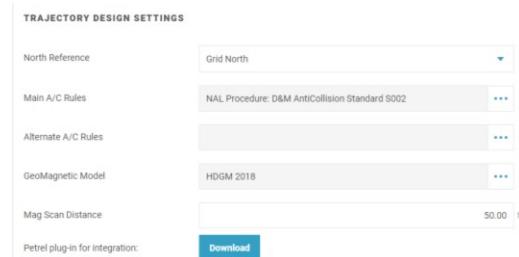


7.2.3 Migrating data (trajectories & sub-surface information) from Petrel to DrillPlan

The data types that can be migrated from Petrel to DrillPlan are:

- Well Plans
- Geological targets
- Regular surfaces (in depth domain)
- Structural Framework horizons (in depth domain)

To perform this task, you need to have Petrel 2018.1 version (or newer) and the DrillPlan plug-in which is available for download directly from the Project Settings.

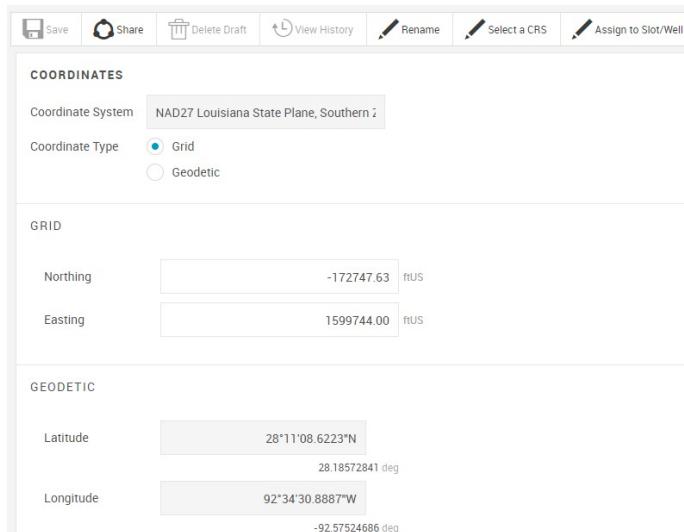


The following steps describe how to migrate data from Petrel to DrillPlan:

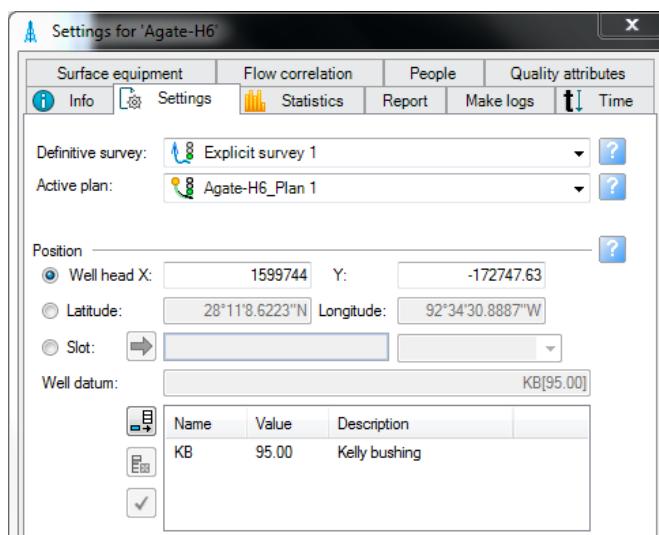
1. At first, make sure the Petrel and the DrillPlan projects have the same CRS assigned. To do so:
 - a. In Petrel navigate to File > Project setup > Project settings > Coordinates and units tab

- b. In DrillPlan navigate to the “Define Surface Location” object and select the defined surface location to check the CRS

In case the above object has not been created yet, create a new “Define Surface Location” object, add a new surface location and click on “Select a CRS”. After selecting the CRS, make sure to define the correct well surface coordinates

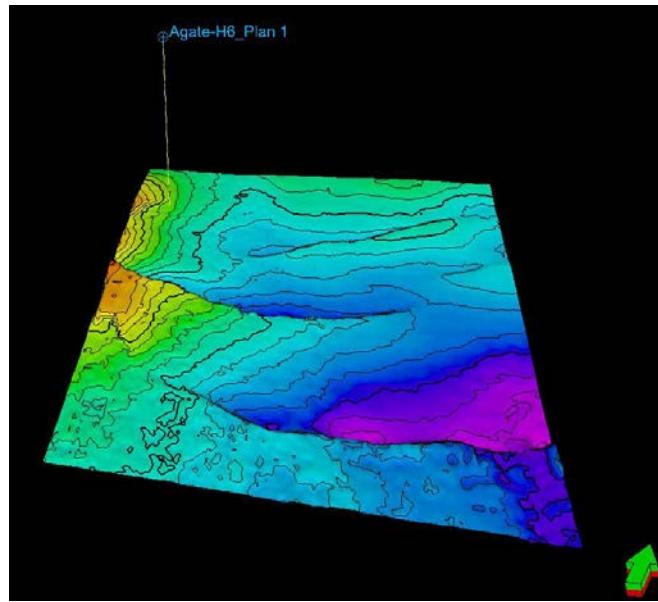


These can be copied and pasted from the Petrel well Settings tab

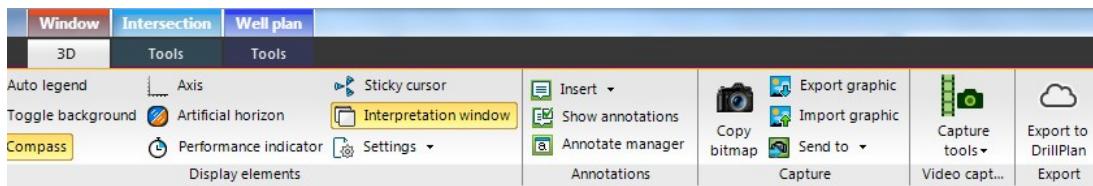


Save and Share the defined surface location

2. In Petrel open a 3D window and display the data to be migrated to DrillPlan

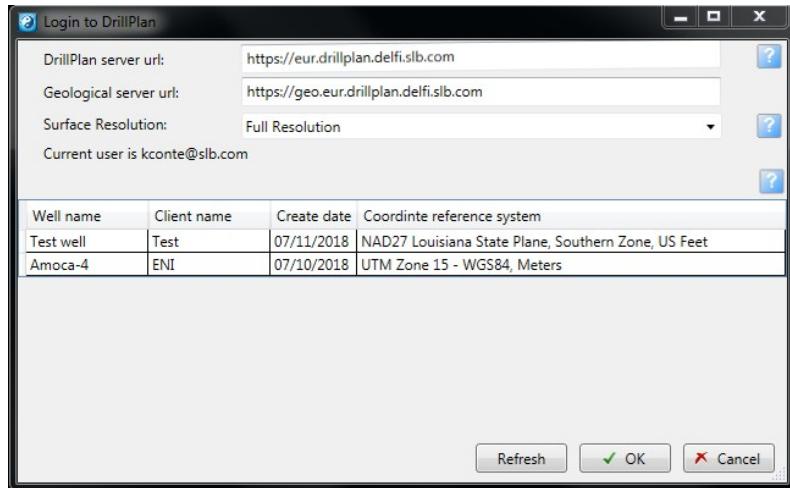


3. Open the 3D window contextual tab and click on “Export to DrillPlan” under the “Export” group

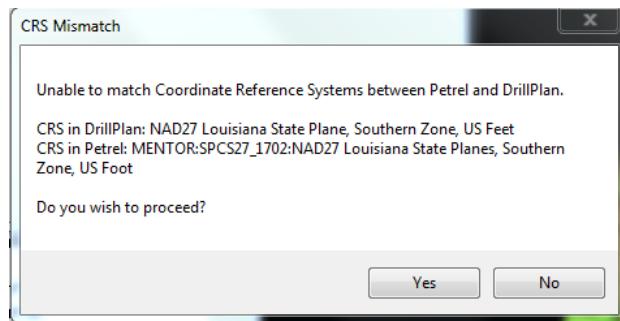


A new login window will open. If this is the first time you log in to the Export to DrillPlan plug-in, valid credentials need to be entered:

- DrillPlan server URL (e.g. <https://eur.drillplan.delfi.slb.com>)
- Geological server URL (e.g. <https://geo.eur.drillplan.delfi.slb.com>)
- Surface Resolution refers to the resolution of the exported regular surfaces. It is possible to export them at full resolution, but in case the dataset is large a decimation factor can be chosen (2x2, 3x3, 4x4 or 5x5)
- The DrillPlan projects table shows the DrillPlan projects on the selected server for which the user has access rights for data transfer. Select the desired project and click OK



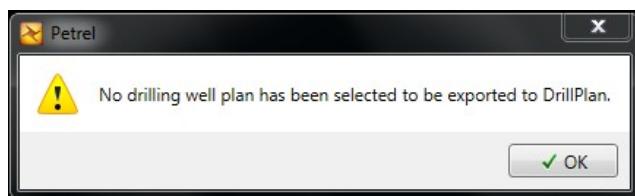
In case the plug-in does not find a perfect match between the 2 CRS, a CRS Mismatch message will appear asking if you would like to proceed or not.



Note: You can export only one well plan for each DrillPlan project. If more than one well plan is displayed in the 3D window, a message appears during the export process.

Note: In case no well plan is displayed in the 3D window a warning message will appear, not preventing you to export other data types to DrillPlan.

Please note the plug-in considers as drilling well plans only the Petrel data objects defined as "Planned well path", created in Petrel by using the "New well plan" or "Insert well plan" functionalities.



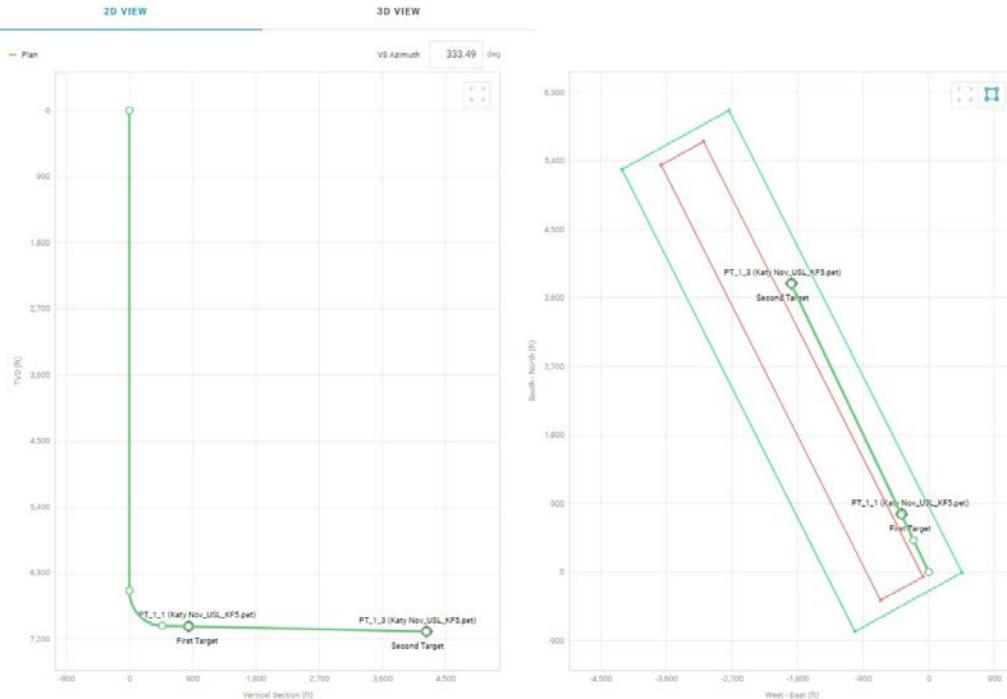


Once displayed data has been successfully migrated to DrillPlan a confirmation message will appear.

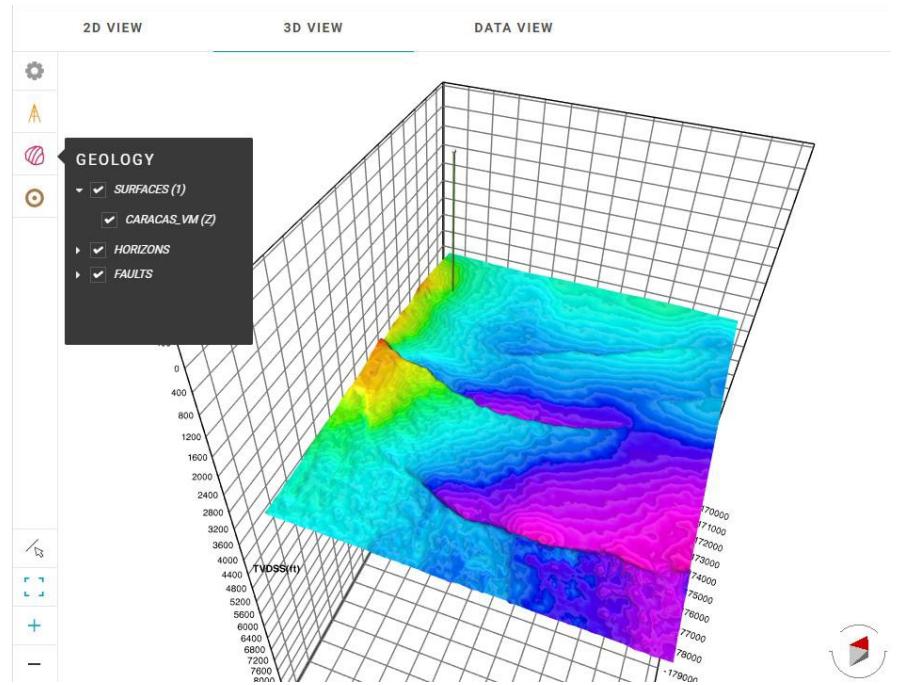


To check the data migrated into DrillPlan follow the steps below:

1. Open the DrillPlan project where data has been sent by using the “Export to DrillPlan” plug-in
2. Open the “Design trajectory” object or create a new one in case it has not been created yet
3. Select the exported plan to open it



4. Click on “3D view” to visualize all the different data types exported from Petrel



Note: To save the mapping information between the Petrel well plan and the DrillPlan project, save the Petrel project before closing Petrel.

The mapping information is saved in the *PushToCloud.DrillPlanMapping.xml* file in the Petrel project “Ocean” folder. If you save the mapping information in Petrel, when you export the mapped well plan to DrillPlan again, the trajectory and targets in DrillPlan are overwritten. Otherwise, new trajectory and targets are created.

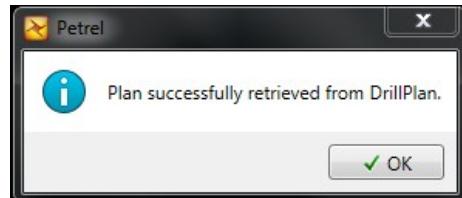
7.2.4 Migrating data (trajectories) from DrillPlan to Petrel

The following steps describe how to migrate well plans from DrillPlan to Petrel:

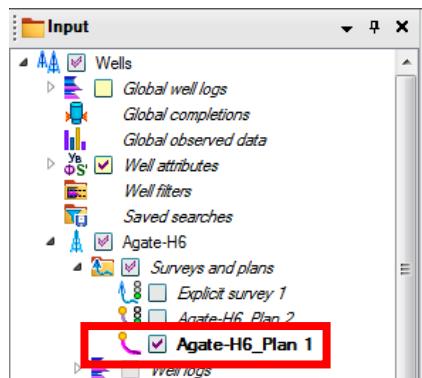
1. In Petrel right click in the Input pane on the well where you want to import the plan and click on Retrieve from DrillPlan
2. The DrillPlan log in window will appear, enter valid server URLs for the DrillPlan and Geological servers and click Refresh

Note: The plug-in retains the server URLs from the last connection in case this is not the first time you log in to the Export to DrillPlan plug-in.

3. In the DrillPlan projects table, select the DrillPlan project that contains the well plan that you want to import into Petrel and click OK
4. The CRS Mismatch warning message will appear in case the plug-in does not find a perfect match between the two CRS
5. In case of successful migration, the following message box will appear



6. In Petrel, the imported plan is stored under the Surveys and plans folder in the Input pane



6.2.5.1 Export a trajectory to a WITSML file

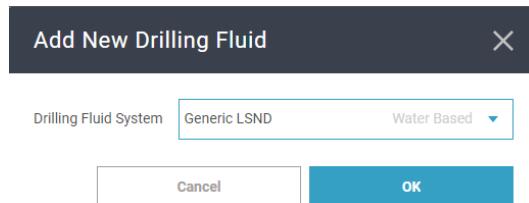
You can export a trajectory in the WITSML 1.3.1 and 1.4.1 formats, so that you can import it into other applications.

To export a trajectory, on the trajectory page, click Export on the command bar. Choose the version to be exported, and then you can save the trajectory XML file to your local drive.

7.3 Drilling Fluid Program Reference

For manually entering the Drilling Fluids Program details, follow the below instructions.

In the Drilling Fluid Intervals, select  to add interval and subsequently add a new fluid. From the drop-down menu, select the Generic LSND and then select OK.

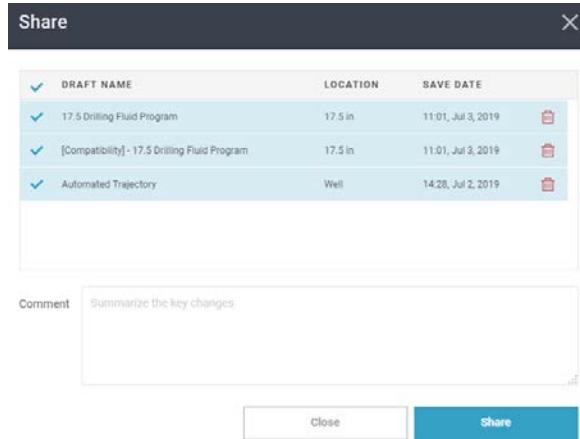


This will enable the right section in order to entry the corresponding data. Fill it with the following:

Properties									
Suction Temp. (degF)	Weighted	Density (lbm/gal)			Density Reference Temp. (degF)	Salt Type	Brine Salinity (%)		
		Recommended	Min	Max			Recommended	Min	Max
95	Yes	10.2	9.5	10.2	95	CaCl2	5.0	2.0	5.0

Rheology		
Input Option	PV, YP, Fann 3/6	
Reference Temp. (degF)	95	
Plastic Viscosity (cP)	Recommended	14.00
	Min	13.00
	Max	16.00
Yield Point (lbf/100ft ²)	Recommended	11.00
	Min	10.00
	Max	12.00
6 RPM Fann Reading	Recommended	3
	Min	3
	Max	4
3 RPM Fann Reading	Recommended	3
	Min	3
	Max	4
Funnel Viscosity (s)	Recommended	70.00
	Min	65.00
	Max	75.00

When all done, Share the object. A confirmation window will show you all elements to be shared. Leave them all ticked, confirm to Share and then, set the progress bar accordingly.



Now repeat these steps with the other 2 drilling fluid programs using the following data:

12.25" section

For the demonstration, the import  option will be used to populate the drilling fluids programs. Use the files provided, ending with the extension .dfx and names with each respective section, to populate the Drilling Fluid program details. For example, use the *12.25_Drilling Fluid Program.dfx* file for the 12.25in section

Drilling Fluid System = MEGADRILL OBM

Properties									
Suction Temp. (degF)	Weighted	Density (lbm/gal)	Recommended	Min	Max	Density Reference Temp. (degF)	Salt Type	Brine Salinity (%)	
150	Yes	12.0	11.0	12.0	75	CaCl2	23	22	23

Base Fluid = Diesel #2 (Red Dyed)

Excess Lime (lbm/bbl) = Recommended = 5.00

Min = 3.50

Max = 5.00

Oil Ratio (%) = Recommended = 80.00

Min = 75.00

Max = 80.00

Secondary Properties(MISC):

HTHP Fluid Loss (mL/30min) = 4.00 / 7.00

Electric Stability (V) = 500 / 700

LGS (%) = 4.00 / 5.00

Rheology		
Reference Temp. (degF)	150	
Plastic Viscosity (cP)	Recommended	25.00
	Min	18.00
	Max	25.00
Yield Point (lbf/100ft ²)	Recommended	14.00
	Min	8.00
	Max	14.00
6 RPM Fann Reading	Recommended	12.00
	Min	10.00
	Max	12.00
3 RPM Fann Reading	Recommended	11.00
	Min	9.00
	Max	11.00
Funnel Viscosity (s)	Recommended	55.00
	Min	45.00
	Max	60.00

Volumes	
Surface Active Volume (bbl)	750.00
Solid Control Efficiency in Current Section (%)	85.00
Washout Coefficient (%)	0.00
Fluid Volume for Contingency (bbl)	0.00
Mud Volume from Mud Plant (bbl)	750.00
Mud Volume from Previous Section (bbl)	0.00
Fraction of Drilled Solids from Plant (%)	3.00

8.5" section

Drilling Fluid System = MEGADRILL OBM

For the demonstration, the import  option will be used to populate the drilling fluids programs. Use the files provided, ending with the extension .dfx and names with each respective section, to populate the Drilling Fluid program details. For example, use the *8.5_Drilling Fluid Program.dfx* file for the 8.5insection

Properties									
Suction Temp. (degF)	Weighted	Density (lbm/gal)			Density Reference Temp. (degF)	Salt Type	Brine Salinity (%)		
		Recommended	Min	Max			Recommended	Min	Max
150	Yes	12.9	11.8	12.9	80	CaCl2	20	14	20

Base Fluid = Diesel #2 (Red Dyed)

Excess Lime (lbm/bbl) = Recommended = 5.00

 Min = 3.50

 Max = 5.00

Oil Ratio (%) = Recommended = 80.00

 Min = 75.00

 Max = 80.00

Secondary Properties (MSC):

HTHP Fluid Loss (mL/30min) = 4.00 / 7.00

Electric Stability (V) = 500 / 700

LGS (%) = 4.00 / 5.00

Rheology		
Reference Temp. (degF)	150	
Plastic Viscosity (cP)	Recommended	25.00
	Min	21.00
	Max	25.00
Yield Point (lbf/100ft ²)	Recommended	14.00
	Min	8.00
	Max	14.00
6 RPM Fann Reading	Recommended	12.00
	Min	10.00
	Max	12.00
3 RPM Fann Reading	Recommended	11.00
	Min	9.00
	Max	11.00
Funnel Viscosity (s)	Recommended	55.00
	Min	45.00
	Max	65.00

Volumes	
Surface Active Volume (bbl)	750.00
Solid Control Efficiency in Current Section (%)	85.00
Washout Coefficient (%)	0.00
Fluid Volume for Contingency (bbl)	0.00
Mud Volume from Mud Plant (bbl)	750.00
Mud Volume from Previous Section (bbl)	0.00
Fraction of Drilled Solids from Plant (%)	3.00

When all done, Share the object. A confirmation window will show you all elements to be shared. Leave them all ticked, confirm to Share and then, set the progress bar accordingly.

7.4 Casing Design

A more in-depth discussion about casing design within DrillPlan begins with the setup, which is in Corporate Settings. The casing design rulesets section of the Corporate Settings page can be split into two main topics: rulesets and load cases.

7.4.1 Rulesets

Rulesets enable you to define mandatory load cases for different well types, fields, or locations where one set of casing load cases might not be applicable to all applications. Rulesets are also where you can define corresponding design factors for each ruleset.

To edit a ruleset, click the Edit  button, directly to the right of the Rulesets title. See below snapshot for reference.

Corporate Settings												GENERAL			SOP		CATALOGS								
DELIVERABLES AND TASKS																									
CASING DESIGN RULESETS																									
Create Defaults																									
LOAD CASE DESIGNS																									
Surface tubing leak...	1	<input checked="" type="checkbox"/>	Regular	Pore pressure	Gas shut-in + packer f...	Static	Onshore & ...	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="radio"/>															
1/3 evacuation	1	<input checked="" type="checkbox"/>	Regular	Old mud max	Air + new mud min	Static	Onshore	<input type="radio"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="radio"/>														
Pressure Test	1	<input checked="" type="checkbox"/>	Regular	Pore pressure	Surface pressure + ol...	Static	Onshore	<input checked="" type="checkbox"/>																	
1/3 replacement to...	1	<input checked="" type="checkbox"/>	Regular	Pore pressure	Gas + new mud max	Circulating	Onshore	<input type="radio"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>							
Gas Kick	1	<input checked="" type="checkbox"/>	Regular	Pore pressure	Gas Kick	Circulating	Onshore	<input type="radio"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="checkbox"/>											
Full evacuation	1	<input checked="" type="checkbox"/>	Regular	Old mud max	Air	Static	Onshore	<input checked="" type="checkbox"/>	<input type="radio"/>																
As Cemented	1	<input checked="" type="checkbox"/>	Installed	User Defined Set Mud ...	Old mud min	Cemented	Onshore	<input checked="" type="checkbox"/>																	
1/3 replacement to...	1	<input checked="" type="checkbox"/>	Regular	Pore pressure	Gas + new mud max	Static	Onshore	<input type="radio"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>							
Surface tubing leak...	1	<input checked="" type="checkbox"/>	Regular	Pore pressure	Gas shut-in + packer f...	Production	Onshore & ...	<input type="radio"/>	<input checked="" type="checkbox"/>																
Green cement pressur...	1	<input checked="" type="checkbox"/>	Green Cement	Old mud min + green ...	Surface pressure + ol...	Cemented	Onshore & ...	<input type="radio"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="checkbox"/>											

Within the edit dialogue box, you can edit the ruleset name, corresponding design factors, and description.

Edit Ruleset

Name * Corporate ruleset

Burst * 1.100

Collapse * 1.100

Tension * 1.400

Compression * 1.250

Von Mises * 1.250

Description

Cancel **OK**

7.4.2 Load cases

Once a ruleset has been selected, the corresponding load cases can be turned on and off to meet the requirements of each ruleset. See below snapshot for reference.

Corporate Settings

DELIVERABLES AND TASKS

CASING DESIGN RULESETS

LOAD CASE DESIGNS

Toggle for enabling a load case for a selected ruleset

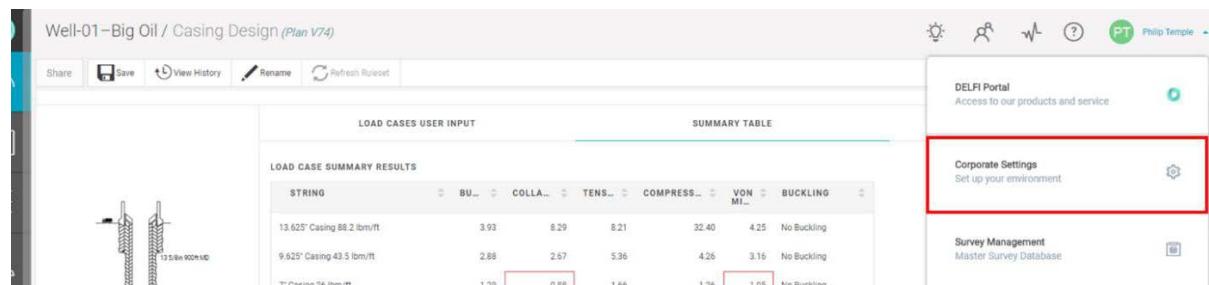
NAME	R	IN SELECT...	TYPE	EXTERNAL PRESSURE	INTERNAL PRESSURE	TEMPERAT...	WELL TYPE	CON...	CAS...	LINER...	TIE-BACK	PRO-CAS...	PRO-LIN...	RULESETS
Surface tubing le...	1	<input checked="" type="checkbox"/>	Regular	Pore pressure	Gas shut-in + packer fl...	Static	Onshore &...	●	●	●	●	●	●	Corporate ruleset
1/3 evacuation	1	<input checked="" type="checkbox"/>	Regular	Old mud max	Air + new mud min	Static	Onshore	●	●	●	●	●	●	
Pressure Test	1	<input checked="" type="checkbox"/>	Regular	Pore pressure	Surface pressure + ol...	Static	Onshore	●	●	●	●	●	●	
1/3 replacement to...	1	<input checked="" type="checkbox"/>	Regular	Pore pressure	Gas + new mud max	Circulating	Onshore	●	●	●	●	●	●	
Gas Kick	1	<input checked="" type="checkbox"/>	Regular	Pore pressure	Gas Kick	Circulating	Onshore	●	●	●	●	●	●	
Full evacuation	1	<input checked="" type="checkbox"/>	Regular	Old mud max	Air	Static	Onshore	●	●	●	●	●	●	
As Cemented	1	<input checked="" type="checkbox"/>	Installed	User Defined Set Mud ...	Old mud min	Cemented	Onshore	●	●	●	●	●	●	
1/3 replacement to...	1	<input checked="" type="checkbox"/>	Regular	Pore pressure	Gas + new mud max	Static	Onshore	●	●	●	●	●	●	
Surface tubing le...	1	<input checked="" type="checkbox"/>	Regular	Pore pressure	Gas shut-in + packer fl...	Production	Onshore &...	●	●	●	●	●	●	
Green cement press...	1	<input checked="" type="checkbox"/>	Green Cement	Old mud min + green ...	Surface pressure + ol...	Cemented	Onshore &...	●	●	●	●	●	●	

The table below gives a summary of the default corporate load cases which are part of the corporate ruleset:

Load Case Name (what if scenario)	Internal Pressure	External Pressure	Temp
Green cement pressure test	Surface pressure (calculated based on 1000 psi differential pressure across float + old mud max).	Old mud weight minimum + cement weight (default 12.5 ppg or mud density + 0.5 ppg, whichever is greater)	Cemented
As cemented	Old mud minimum	Old mud weight max + cement weight (default 12.5 ppg or mud density + 0.5 ppg, whichever is greater).	Cemented
Pressure test	Surface pressure applied + new mud weight maximum. Surface pressure calculated to test casing to 80% of burst rating.	Pore pressure	Static
1/3 gas replacement static	0 psi/ft from one-third of the total vertical depth to surface + new mud weight maximum below the gas. Surface pressure equal to the mud weight (ppg) \times 0.05195 \times 1/3 total vertical depth (ft).	Pore pressure	Static
1/3 evacuation	0 ppg (air) to 1/3 TVD + new mud weight minimum	Old mud weight maximum	Static
Full evacuation	Air (0 ppg)	Old mud weight maximum	Static
Surface tubing leak static	Shut-in tubing pressure (default calculated from gas gradient from pore pressure at open hole TD) + packer fluid (default 8.51 ppg).	Pore pressure	Static
Surface tubing leak hot	Shut-in tubing pressure (by default, this is calculated from the gas gradient from the pore pressure at the open hole TD) + packer fluid (density user-defined).	Pore pressure	Production
1/3 replacement to gas circulating	0 psi/ft from 1/3 TVD to surface + new maximum mud weight below the gas. The surface pressure is equal to the mud weight (ppg) \times 0.05195 \times 1/3 TVD (ft).	Pore pressure	Circulating

7.4.3 Adding, editing, and deleting a load case

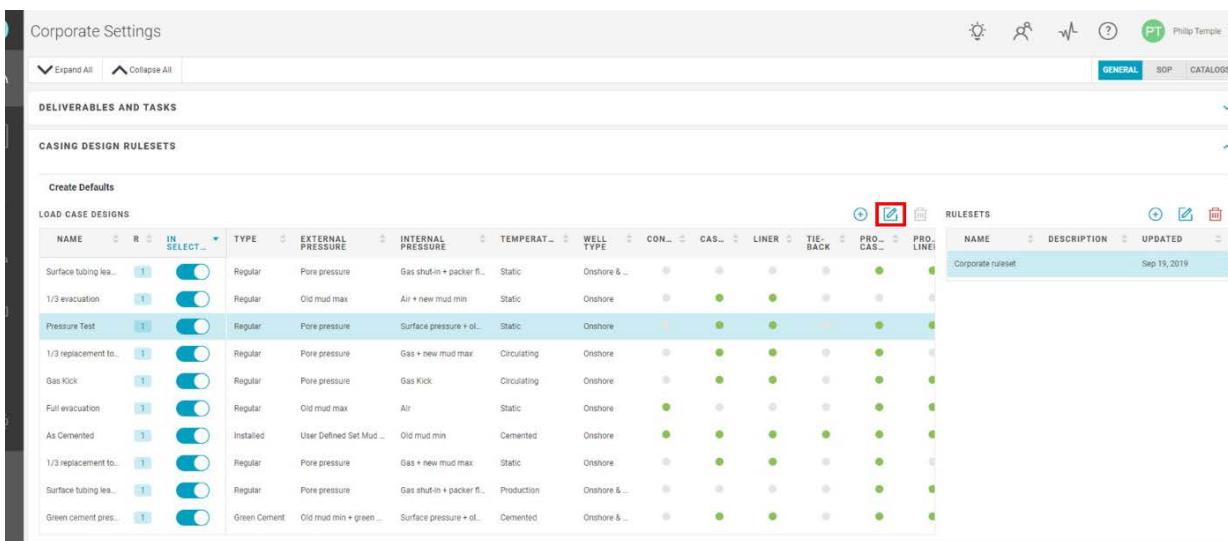
In the case a load case needs editing, removal, or an additional load case is required, then this will need to be managed in corporate settings.



The screenshot shows the 'Well-01-Big Oil / Casing Design (Plan V74)' page. At the top, there are buttons for Share, Save, View History, Rename, and Refresh Ruleset. Below this is the 'LOAD CASES USER INPUT' section with a diagram of a wellbore and a table of load case results. To the right is the 'SUMMARY TABLE' section. In the top right corner of the main content area, there is a 'Corporate Settings' button, which is highlighted with a red box.

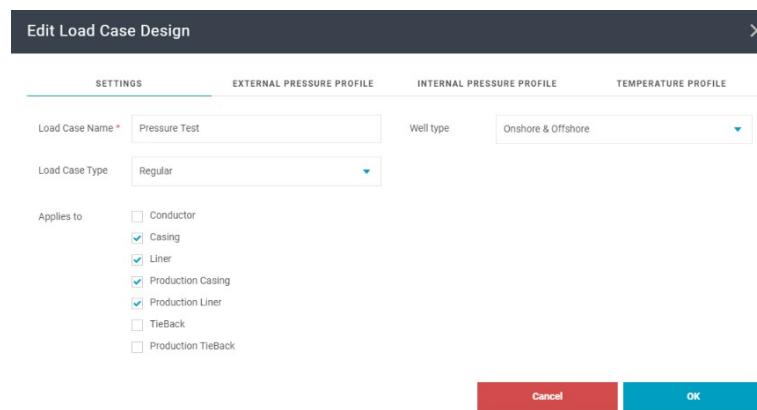
6.4.3.1 Editing a load case

On the Corporate Settings page, under Casing Design Rulesets, in the Load Case Designs table, select the load case that you want to edit, and select Edit  as illustrated below.



The screenshot shows the 'Corporate Settings' page with the 'GENERAL' tab selected. Under 'DELIVERABLES AND TASKS', there is a 'CASING DESIGN RULESETS' section. Within this section, there is a table titled 'LOAD CASE DESIGNS'. The 'Pressure Test' row is selected and has an edit icon () highlighted with a red box. To the right of the table is another table titled 'RULESETS'.

In the Edit Load Case Design dialog box, edit the load case parameters and select OK.



The screenshot shows the 'Edit Load Case Design' dialog box. The 'SETTINGS' tab is active. It contains the following fields:

- Load Case Name: Pressure Test
- Load Case Type: Regular
- Applies to:
 - Conductor
 - Casing
 - Liner
 - Production Casing
 - Production Liner
 - TieBack
 - Production TieBack

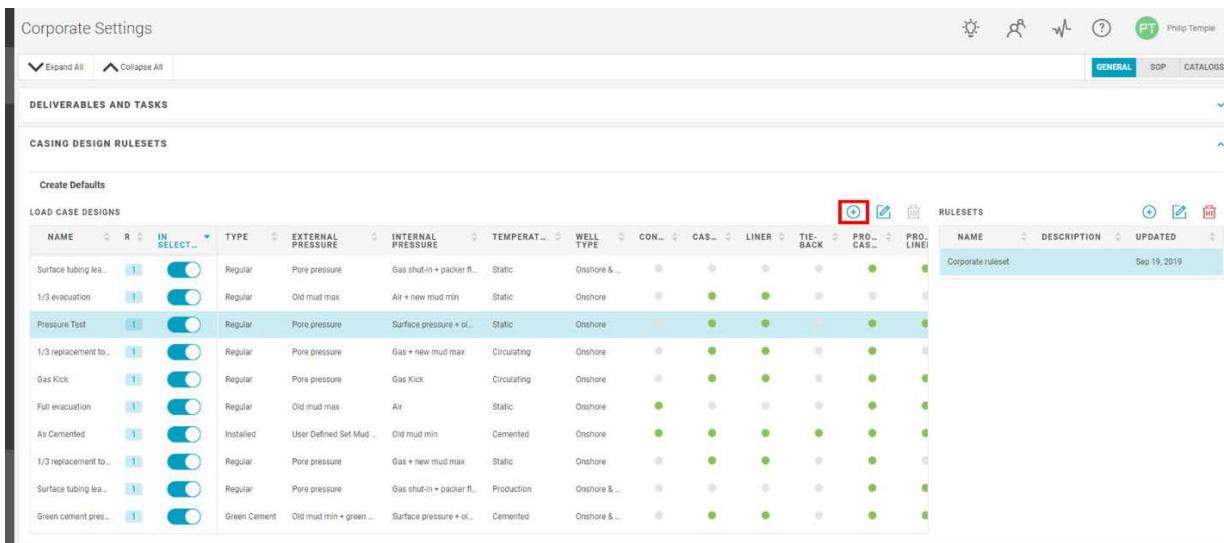
At the bottom are 'Cancel' and 'OK' buttons.

If you change the name, it is saved as a new load case design.

Note: The modified load case design does not apply to any existing casing design unless you select Refresh Ruleset on the casing design editor page inside a project. When you create a new casing design, the latest available load case designs apply.

6.4.3.2 Create a load case

Under Casing Design Rulesets, in the Load Case Designs table, select Add  to open the New Load Case Design dialog box.



Casing Design Rulesets														
Create Defaults														
Load Case Designs														
Name	R	In Select...	Type	External Pressure	Internal Pressure	Temperature	Well Type	Conn.	Casing	Liner	Tie-Back	Prod. Cas.	Prod. Line	Rulesets
Surface tubing le...	1	<input checked="" type="checkbox"/>	Regular	Pore pressure	Gas shut-in + packer fl...	Static	Onshore & ...							Corporate ruleset
1/3 evacuation	1	<input checked="" type="checkbox"/>	Regular	Old mud max	Air + new mud min	Static	Onshore							
Pressure Test	1	<input checked="" type="checkbox"/>	Regular	Pore pressure	Surface pressure + ol...	Static	Onshore							Corporate ruleset
1/3 replacement to...	1	<input checked="" type="checkbox"/>	Regular	Pore pressure	Gas + new mud max	Circulating	Onshore							Corporate ruleset
Gas Kick	1	<input checked="" type="checkbox"/>	Regular	Pore pressure	Gas Kick	Circulating	Onshore							Corporate ruleset
Full evacuation	1	<input checked="" type="checkbox"/>	Regular	Old mud max	Air	Static	Onshore							Corporate ruleset
As Cemented	1	<input checked="" type="checkbox"/>	Installed	User Defined Set Mud ...	Old mud min	Cemented	Onshore							Corporate ruleset
1/3 replacement to...	1	<input checked="" type="checkbox"/>	Regular	Pore pressure	Gas + new mud max	Static	Onshore							Corporate ruleset
Surface tubing le...	1	<input checked="" type="checkbox"/>	Regular	Pore pressure	Gas shut-in + packer fl...	Production	Onshore & ...							Corporate ruleset
Green cement pres...	1	<input checked="" type="checkbox"/>	Green Cement	Old mud min + green ...	Surface pressure + ol...	Cemented	Onshore & ...							Corporate ruleset

- 1) On the Settings tab, enter the required settings:

- a. Enter a Load Case Name.
- b. Select the Load Case Type.

The available types are:

Green Cement: A pre-defined load case that assumes the cement is in a liquid state. Several green cement load case definitions can exist and run as independent loads.

As Cemented: A pre-defined load case that represents the initial conditions for the life service loads.

Regular: A life cycle loads that use the as cemented load case as the initial conditions.

Note: You must define an As Cemented load case for a ruleset. If the As Cemented load case is not defined, none of the regular load case definitions are applied. There cannot be more than one As Cemented load case definition.

- c. Select the check boxes of the casing types that you want to apply the load case to. If you do not select any casing types, the load case is not applied to any project.
- d. Select the Well Type that the load case is applied to.



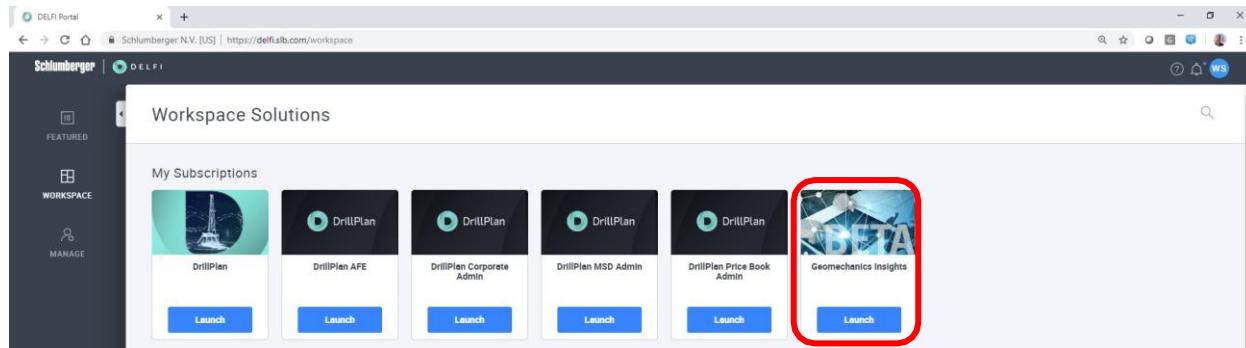
- e. If you selected As Cemented or Green Cement as the Load Case Type, select Auto for the Pick Up/Slack Off.
- 2) On the External Pressure Profile tab, enter a Name, and enter the required gradient segments and boundary conditions.
- 3) On the Internal Pressure Profile tab, enter a Name, and enter the required gradient segments and boundary conditions.
- 4) On the Temperature Profile tab, enter a Name and select the temperature profile: Static, Cemented, Production, Injection, or Circulating

Select OK to add the load case to the Load Case Designs table. The load case is saved and applied to all casing design objects which utilize a ruleset with this load case enabled.

7.5 Mud Weight Window (Geomechanics Services)

This step can fully replace the Mud Weight Window – Manual Input (described in section 4.6) if desired by the user.

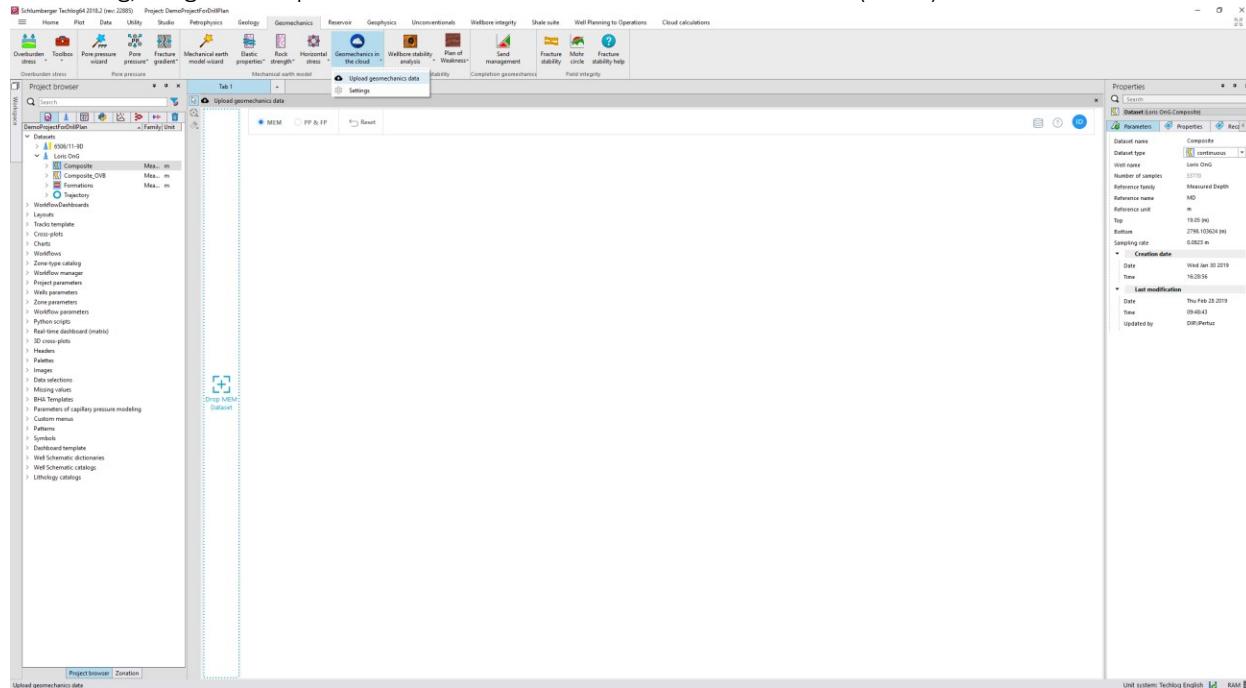
To work with this feature, you will need to have the Geomechanics Insights application subscription.



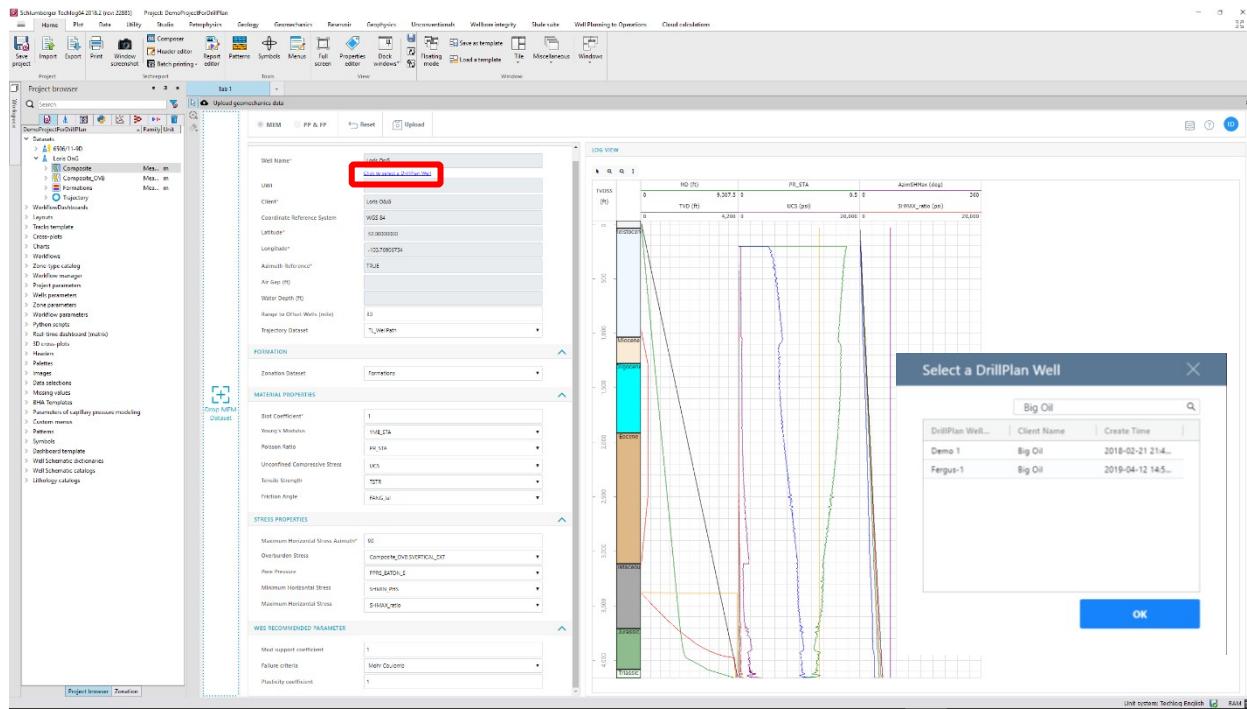
Moreover, to get the mud weight window from the Geomechanics Insights service, you need to have Techlog 2018.1 version (or newer) and the Geomechanics in the Cloud plug-in (no license required for the plug-in) which is available for download from the Schlumberger Software Download Center: <https://www.sdc.oilfield.slb.com/sis/ProductDetails.aspx?ID=23330>.

The Geomechanics Insights application enables you to upload MEM swiftly from Techlog to the cloud using the 'Geomechanics in the cloud' plugin. The uploaded MEMs can be viewed and quality-checked in a web browser, and then further used to provide geomechanics insights for other DELFI applications.

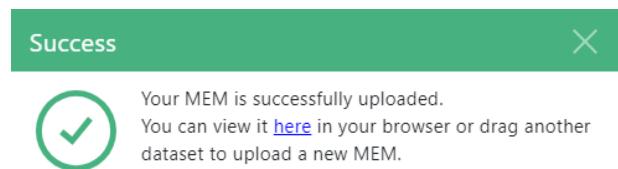
In Techlog, drag and drop the dataset with the Mechanical Earth Model (MEM).



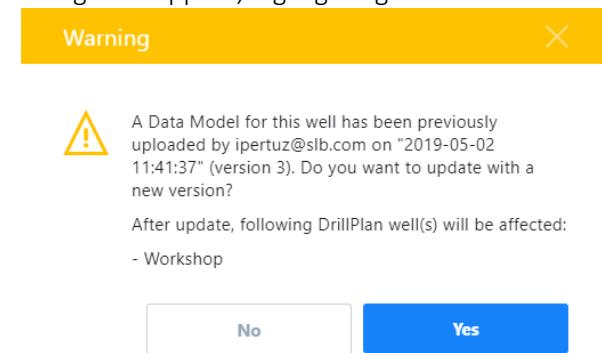
Verify that the right variables are selected in the Material Properties and Stress Properties. The MEM can be either valid for an area defined by the Range to Offset Wells (miles), or it can be directly assigned to a particular well/project in DrillPlan to trigger specific computations.



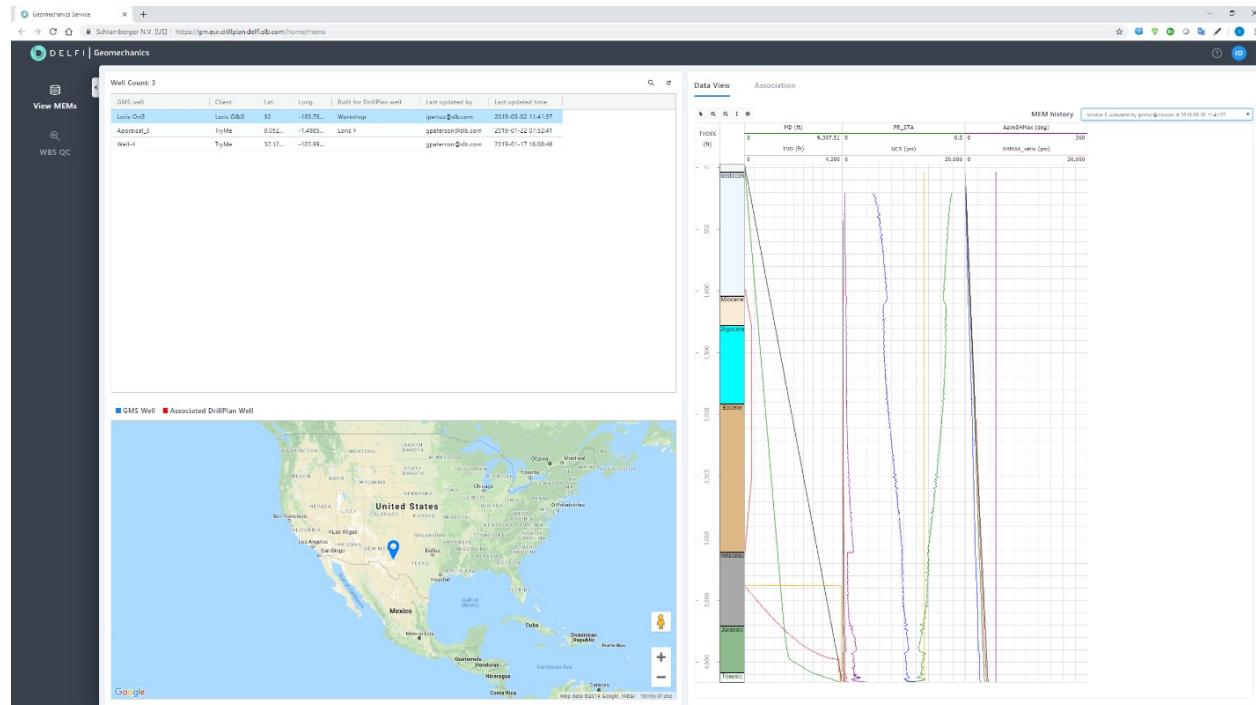
Upload the MEM, and a confirmation message will appear, with a link to look at the information in the Cloud.



The model can be updated, adjusted and uploaded to the Cloud as many times as required. If there is an existing version, a Warning message will appear, highlighting which DrillPlan well will be affected.

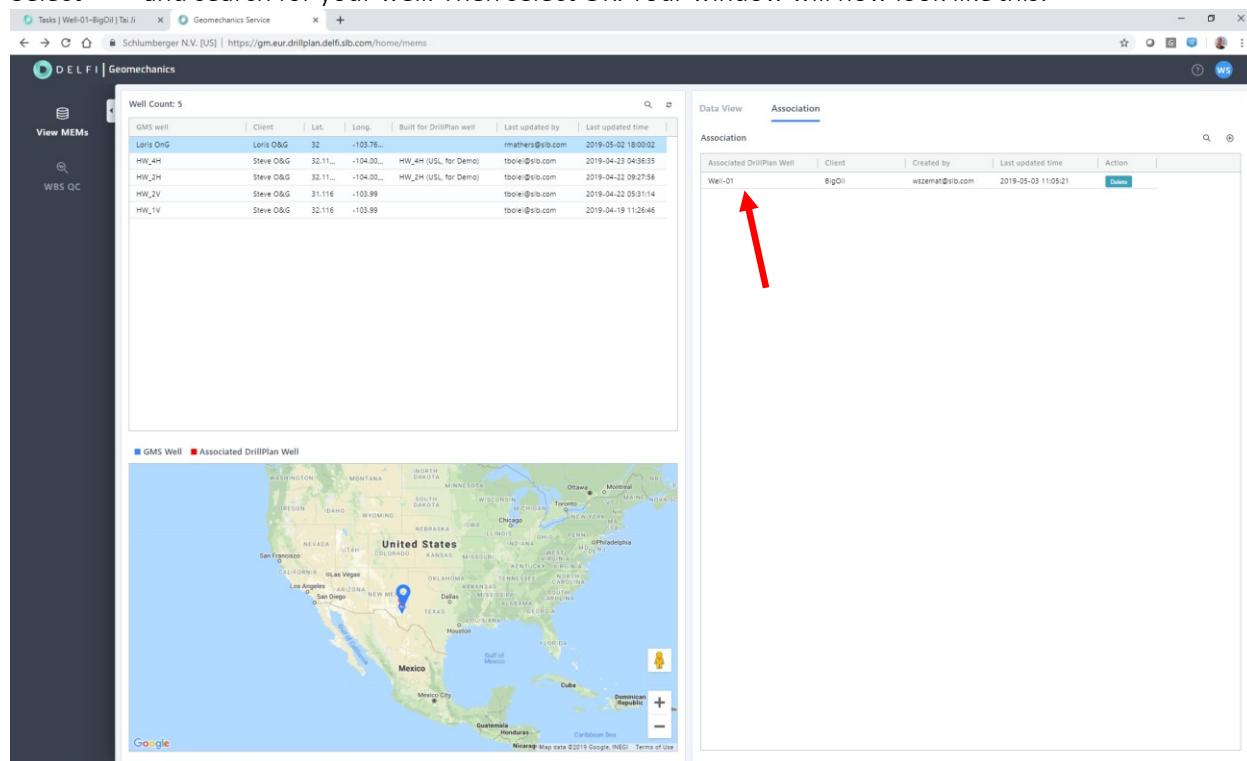


Once in the cloud, the MEM can be verified using the Geomechanics Insights application.



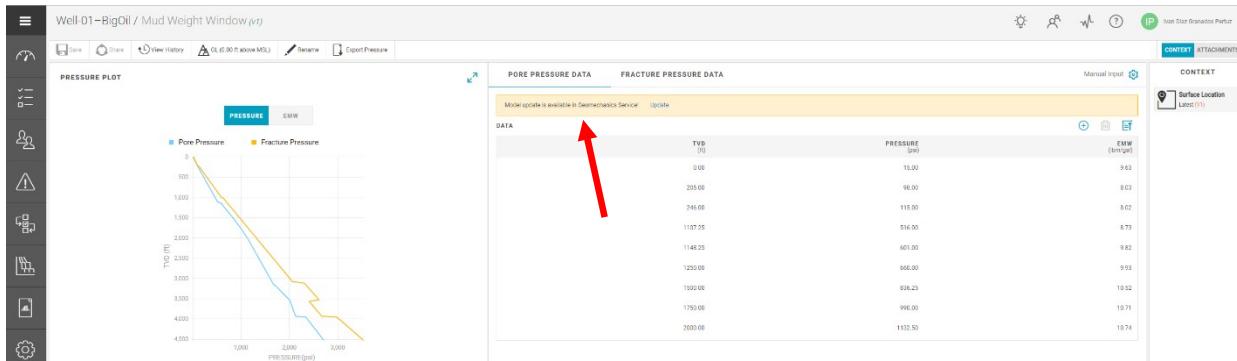
In the Association section, you can directly define which are the wells that will be linked to this MEM.

Select  and search for your well. Then select OK. Your window will now look like this:

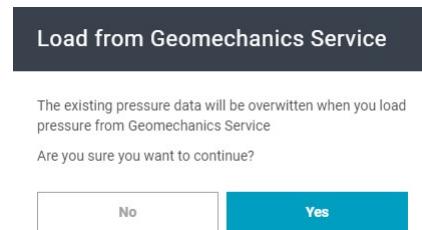


In the map window, you can zoom in/out to easily and geographically contextualize the location of your MEM defined area and the associated well(s).

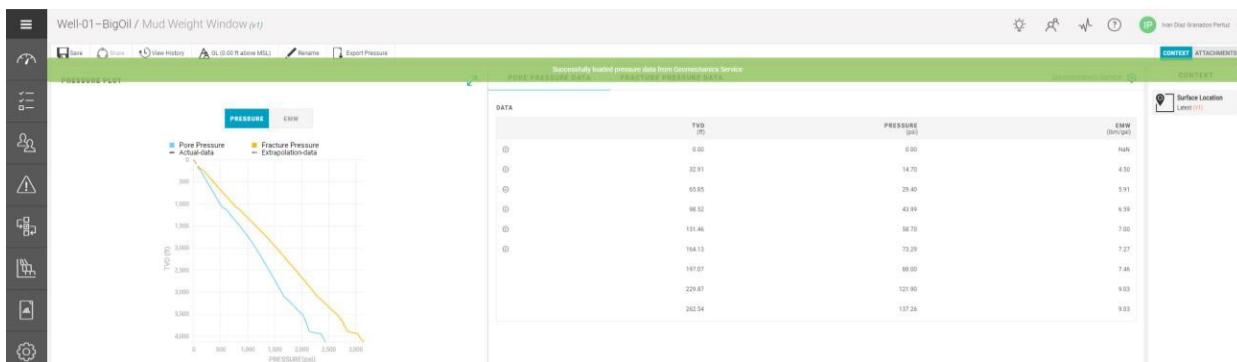
Back to your well in DrillPlan, go to the Mud Weight Window object. After uploading the MEM to the Cloud, a message bar will state “*Model update is available in Geomechanics*”.



Once you select Update, a message box will appear, requesting confirmation of the data overwriting.



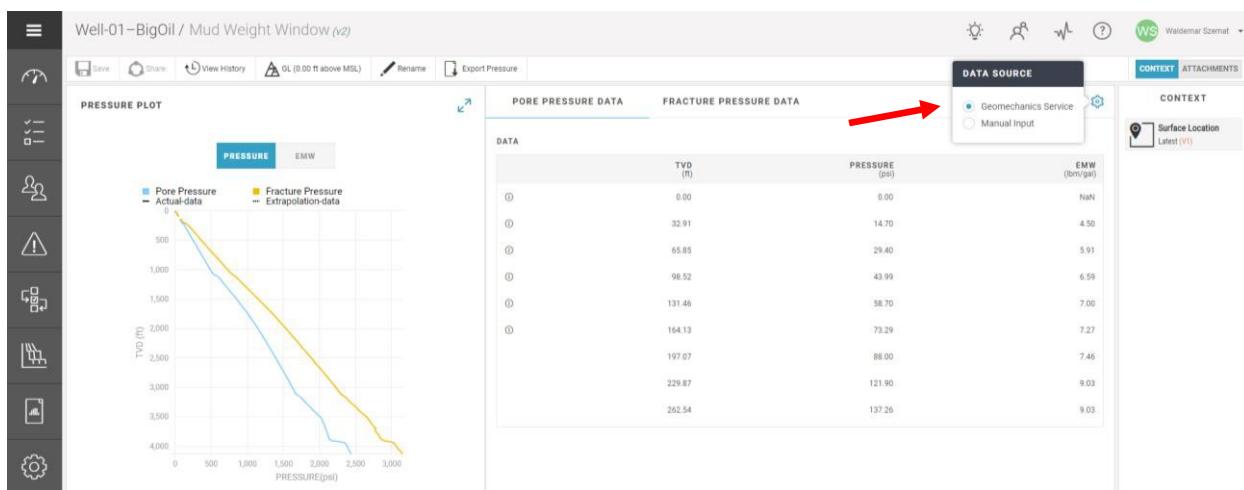
After confirmation, remember to save, share and set progress accordingly.



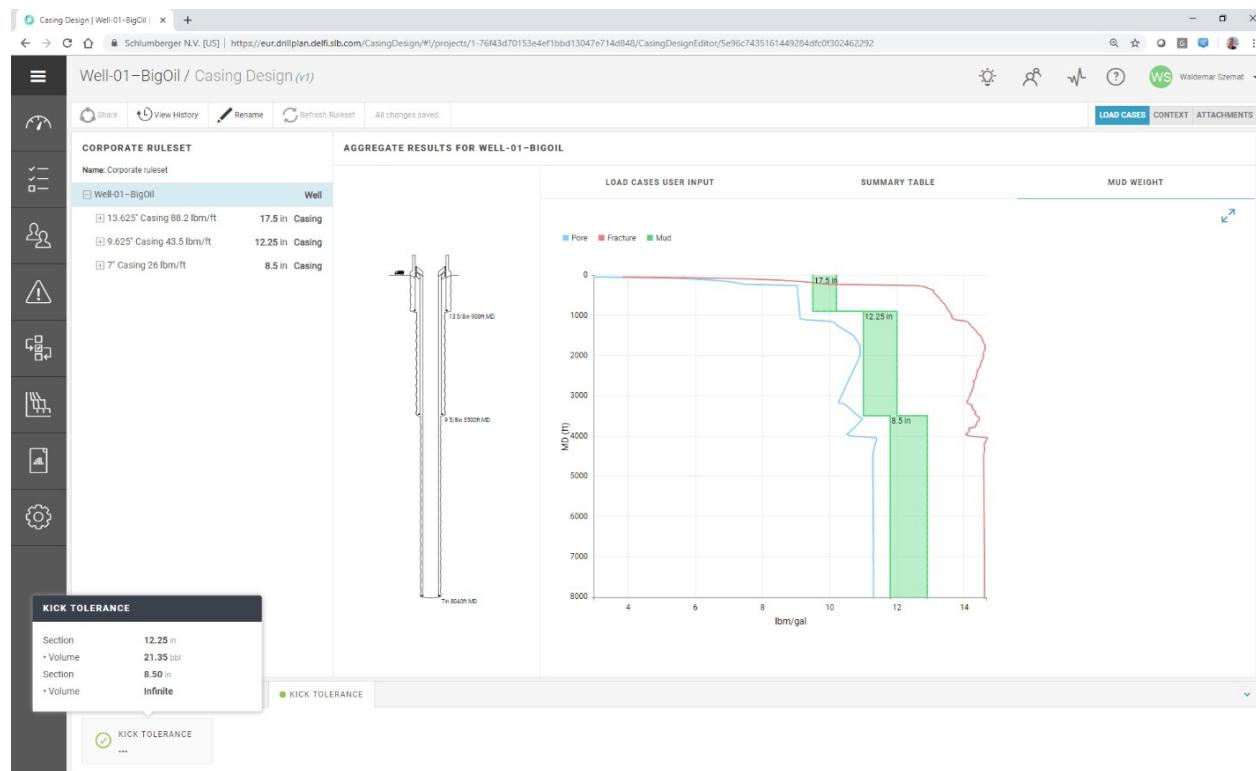
If you are interested in reading the corresponding pore and fracture pressure values at a given depth, hoover your mouse over the plot on the left side, or expand it for reading convenience.



When you work this object in a collaborative manner, you can change the data source to Geomechanics Service or Manual Input in the Settings bottom on the top right corner, at any given time.

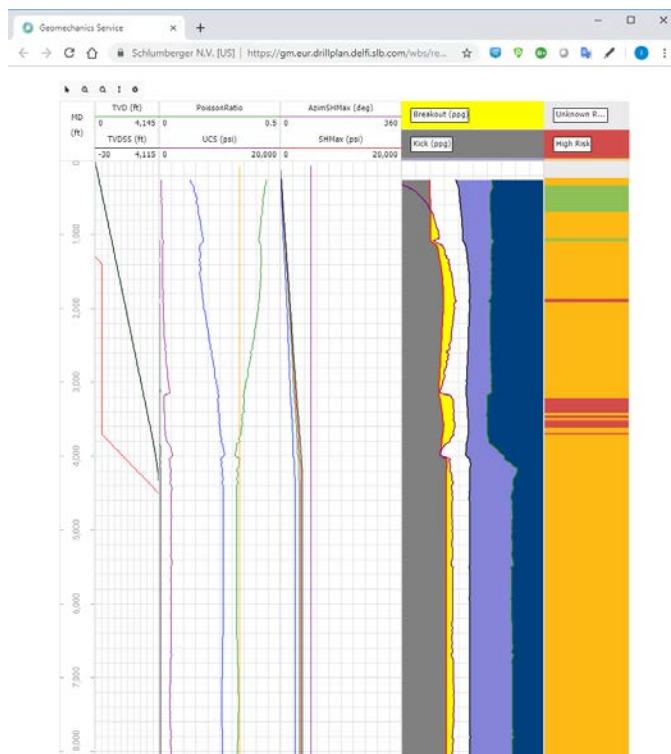
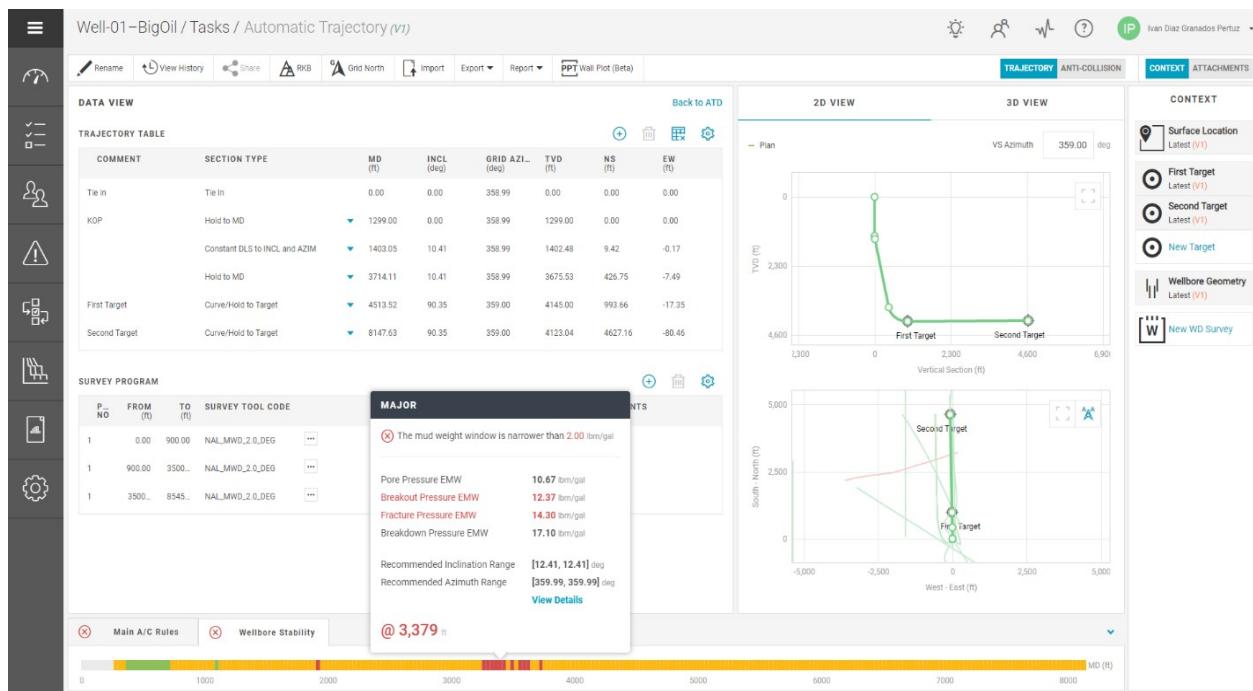


After the MEM is defined and assigned to the DrillPlan well, the mud weight window is calculated for the current trajectory, and all the workflows verify the results against its limits, and flag if any is trespassed, as it is done for the Kick Tolerance Calculation in the Casing Design.



We have seen how you can design a Trajectory using the Automatic Trajectory Design (ATD) workflow. When the geomechanics service is linked to your project, it will get the risks (on the bottom bar) based on the anti-collision rules, and mud weight window defined by your MEM.

The risk bar is interactive and provides information about the mud window by clicking on the color bar. If needed, the trajectory can be adjusted, the mud weight window – and the resulting risks – would be recalculated. This can be an iterative process where you can utilize your drilling engineering expertise and support it with the insights provided by DrillPlan until the risk is reduced to the level of satisfaction.



In addition to providing the wellbore stability risk bar in the automated trajectory design object, the mud weight window object can also be directly updated with pore pressure and fracture pressure information from the same MEM to ensure consistency in the workflow. The design of Geomechanics Insights allows the user to utilize MEMs in a highly effective and automated way leveraging one MEM for WBS computations for wells designed throughout an entire play.

If more details are required, the full mud weight window can be seen in the Geomechanics Service by clicking View Details on the bottom of the risk card.

Uploaded MEMs can be automatically applied to compute wellbore stability analyses (WBS) within DrillPlan and alongside other engines. When a trajectory in DrillPlan is designed, the wellbore stability analysis is automatically computed - provided a MEM has previously been assigned to the planned well. Every change in the trajectory design will also trigger a computation and update the wellbore stability analysis. The WBS result is presented to the DrillPlan user in a colored-coded, dynamic and intuitive risk bar highlighting depth intervals of narrow mud weight windows. Upon selecting, further details on the WBS results are provided in the Geomechanics Insights web interface.

In addition to providing the wellbore stability risk

7.6 How to create Custom SOP

At this point, DrillPlan will automatically create the SOP template using the operational sequencing from the offset wells available in the system. However, if you are interested in creating your own SOP template, you can create a standard operation procedure (SOP) template on the Corporate Settings page and generate the activity plan based on the selected SOP template in the Project Settings.

- On the Corporate Settings page, in the SOP view, select New Template
- In the New Template pane, edit the Template Name, and enter a Description
- Search for the activity by typing the key words in the Activity List box
- Select an activity in the Activity List, and in the rightmost pane, edit the activity Notes and Time, ROP, or Speed, as applicable
- Select Add Attachment to add an attachment for the current activity
- To add a specific section in the SOP, select Add Hole-Size-Specific Construct Section next to the Activity List
- In the Add Construct Section dialog box, enter the Section size
- In the Copy from list, select an existing section in the SOP to use as the default template for the section
- Click Add to add the specified section in the SOP
- You can edit the section based on an existing SOP in the Construct well tree
- To delete an SOP template from the Templates list, point to the SOP template and select delete

Back to the exercise, your activity plan will look like this:

7.7 Scheduler Activities List

You can add activities to a section in the **Scheduler** view.

The activities that you can add to open holes include:

- Clean out run
- Drill stem test
- Wireline
- Slickline
- Recover mechanical plug

The activities that you can add to cased holes include:

- Clean out run
- Recover mechanical plug
- Set cement plug
- Set mechanical plug
- Slickline
- Wireline
- Jet sub run
- Surface stack activities

If the last section is an open hole, you can add **Surface stack activities**.

The activities that you can add to completion views include:

- Surface flow back system activities (Rig up surface flow back system)
- Recover mechanical plug run (Wellbore clean out)
- Jet sub run (Wellbore clean out)
- Drift run (Wellbore clean out)
- Clean out run (Wellbore clean out)
- Wireline run (Install lower completion with production casing)
- Slickline run (Install lower completion with production casing)
- Run casing with lower completion (Install lower completion with production casing)
- Cement casing (Install lower completion with production casing)
- Run liner with lower completion (Install lower completion with production casing)
- Cement liner (Install lower completion with production casing)

- Expand lower completion run (Install lower completion with production casing)
- Recover mechanical plug run (Install lower completion inside production casing)
- Wireline run (Install lower completion inside production casing)
- Slickline run (Install lower completion inside production casing)
- Polish dress test liner top run (Install lower completion inside production casing)
- Run working string conveyed completion (Install lower completion inside production casing)
- Run tubing conveyed completion (Install lower completion inside production casing)
- Clean out run (Install lower completion inside production casing)
- Gravel pack installation run (Install lower completion inside production casing)
- Stimulate well (Install lower completion inside production casing)
- Run single string temporary upper completion (Install upper completion)
- Run single string upper completion (Install upper completion)
- Run dual string upper completion (Install upper completion)
- Surface stack activities (Secure well)