Outline

- Canbriam Background
- Montney Project Overview
- Development Planning Requirement
- Historical Workflow
  - Evolution, challenges and limitations
- Planning Software Requirements
- Altares Development Plan
- DecisionSpace™
  - Description and how we use it
- Benefits
Canbriam Background

- Canbriam Energy Inc. is a private emerging intermediate exploration and production company focusing on unconventional resource identification and development.
- Canbriam was established in Q4 2007 and founded in January of 2008
- Strategy of organically establishing large scale gas resource development with:
  - Concentrated land position in attractive operating environments
  - Significant resource base
  - Industry leading supply costs
  - High degree of control (operatorship and reasonable lease retention)
  - Infrastructure to accommodate large scale development (access, pipelines, water)
 Altares / Farrell Creek Montney Project

- Large multi-zone land base
  - 38 Tcf of OGIP (>11 Tcfe recoverable resource)
  - 62,000 net acres
  - Operated 95 net sections (85% average W.I.)
  - > 1500 net locations
  - Liquids-rich (~50 bbls/mmcf on ~50% of land)
- Initial development phase underway
  - Currently producing 10,000 boe/d (~80% gas)
  - Building additional infrastructure to accommodate long term growth
  - Growth strategy designed to grow 3-4x in the next 2-3 years
High liquids content, high reservoir pressure

Liquids Content across Montney Trend

Reservoir Pressure Across Montney Trend
Multi-zone targets within the Montney
Why Full Field Development Planning?

- Critical to understand the vision of development
- Surface land pre-planning is essential
- Accurate well and pad placement and design
- Facilities and infrastructure requirements
- Reserves management
- Capital forecasting and cash flow modeling
- Communication with the board and investment community
Historical Workflow

- Utilized tools that were in-house
- PowerPoint – ineffective for anything other than visualization
Historical Workflow

- Utilized tools that were in-house
- By default, Accumap was adopted as the development planning tool
Historical Workflow

- Utilized tools that were in-house
- By default, Accumap was adopted as the development planning tool
- Topographic maps and satellite imagery were used to determine pad locations
Historical Workflow

- Utilized tools that were in-house
- By default, Accumap was adopted as the development planning tool
- Topographic maps and satellite imagery were used to determine pad locations
- All future locations were mapped (drawn)...by hand
Historical Workflow

- Inability to accurately plan build and turns resulted in a heavy reliance on the directional survey company
- Coordinates provided to the field and directional company were inaccurate
- Pad planning was crude and resulted in multiple scouting and numerous survey revisions
Historical Workflow

- Limited to 2D planning
- Multi-target planning was near impossible
- Scenario comparisons were time consuming
- Early wells were drilled off azimuth and varied significantly from what was planned
Canbriam Well Planning Requirements

- Ability to deal with multiple targets
- Proactive wellbore trajectory planning and anti-collision pre-planning
- Easily share data with directional survey companies
- Flexibility to create various development scenarios
- Accurately place wells and pads with a built-in GIS interface
- Integrate topographic and satellite imagery data within the tool
- Precise pad planning and survey integration
- Utilize tool for infrastructure planning
- Minimize cycle time and re-work
- Improve integration within the organization

- Not many options available in the market
Collaborative Well Planning - DecisionSpace™

- A unified 3D workspace that is able to integrate data from numerous sources (geologic, topographic, satellite images)
- Surface and subsurface planning in one environment
- Ability to design complex well paths and easily transfer directional data to survey companies (Compass™)
- Flexibility to create various development scenarios
- Accurately place wells integrating GIS objects
- Ability to place wells relative to specific geologic targets
- Software utilization for infrastructure planning
- FAST!
DecisionSpace™ Implementation

- Ability to access large amounts of data via OpenWorks database
  - Full Wells DB schema including stimulation data
DecisionSpace™ Implementation

- Ability to access large amounts of data via OpenWorks database
  - Full Wells DB schema including stimulation data
  - Hydrology, mineral land, and landowner information
DecisionSpace™ Implementation

- Ability to access large amounts of data via OpenWorks database
  - Full Wells DB schema including stimulation data
  - Hydrology, mineral land, and landowner information
  - Digital Elevation data/LiDAR
DecisionSpace™ Implementation

- Ability to access large amounts of data via OpenWorks database
  - Full Wells DB schema including stimulation data
  - Hydrology, mineral land, and landowner information
  - Digital Elevation data/LiDAR
  - Geologic surfaces, geophysical properties, fault planes and other cultural /structural elements
DecisionSpace™ Implementation

- Satellite imagery
- Pipelines, roads and culture data
- Existing Pads

![DecisionSpace Implementation Diagram]
DecisionSpace™ Well Planning Workflow

1. Create laterals (stubs) within the development polygon
   - Define hazards and boundaries
   - Heel and toe targets created automatically by referencing geologic grids
   - Determine optimum lengths, spacing and azimuths for maximum reservoir contact
   - Multiple/stacked laterals are easy to plan
2. Plan the pad locations
   - Determine type of pads (size and number of wells per pad)
   - Use the DEM/LIDAR grid and specify parameters to locate platforms
3. Create directional plans
   • Once the directional parameters are defined, Decision Space will automatically compute the trajectory for each lateral and connect to the pads
4. Assign each well a slot on the pad
   • Input slot placement
   • Assign a slot to each well
5. Export the outputs (.WBP file) to survey and directional companies
   • Re-import revised .WBP file and replace original plan

![Diagram](image-url)
5. Export the outputs (.WBP file) to survey and directional companies
   • Re-import revised .WBP file and replace original plan
Resulting Development Plan

BEFORE

AFTER
DecisionSpace™ Well Planning Benefits

- **One Stop Data Shop**
  - Ability to integrate relevant data into one domain

- **Flexible**
  - Sensitivity scenarios are simple to produce
  - Plan is evergreen and updated with actual results

- **Efficient**
  - Significant reduction in cycle time and re-work

- **Budgeting and Valuations**
  - Rig schedule is based on development plan

- **Reserve planning**
  - Provide reserve auditor with a detailed plan for future locations

- **A&D Evaluations**
  - Simple to create a full-field development plan for potential acquisitions or land sale evaluations

- **Collaboration**
  - The tool has become the epicentre for multi-disciplinary approach to development planning
Acknowledgements

Landmark/Halliburton
  Matt Williams
  Terry Pinnix
  Tom Pierce
  Andy Shackley
  Subbu Annamalai
  Rafat Iqbal
  Sam Cokar

Canbriam
  Hugo Alexander Martinez
Questions