Collision Avoidance Subcommittee Update

Darren Aklestad - SLB
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SPE ACR Adoption Status

- 16 Attendees – 6 Yes (5 orgs) – Higher percentage than previous meetings
  - Oxy
  - Baker-Hughes
  - Schlumberger (DrillPlan)
  - Dynamic Graphics (WellArchitect)
  - Halliburton/Landmark (Compass)

Review of Outstanding Actions

- Update Documentation – Bibliography / Lexicon / Merge efforts with other groups
- Sidetrack handling CA diagnostics files and Rev 5 update of benchmarks
- Collision Avoidance – Reporting Standardization
- Standard Rule – Guidance memo – modification of Sm & Pa
- Inferred Wellbore Position – a committee formed
- Guidance on Survey Interval in relation to Collision Avoidance **New **

CA Survey Interval Guidance

- OWSG Request for Review / Guidance

CA Survey Interval – SPE-184730 Well Collision Avoidance Management Principles

Surveying Interval. The following recommendations for the maximum survey interval are intended only for safe-separation and collision avoidance, Table 3. They do not address the requirements for routine drilling and meeting other well objectives such as targets. To be valid, all surveys are required to pass the quality control criteria appropriate to the survey tools and the applied IPMs. In general, the survey frequency increases with increasing dog-leg severity (DLS) and decreasing SF. The intervals may be adjusted for non-standard tool joints or stands (Double, Triple, Quad and Range I, II, III). The intervals may also be extended where the continued divergence of the reference well from all the offset wells has been firmly established.

Table 3—Recommended maximum survey interval for safe-separation and collision avoidance

Maximum Survey Interval [ft]		DLS [deg/100ft MD]		
		<1	1 – 5	>5
SF [-]	>2	200	100	33
	1.5 – 2	100	100	33
	<1.5	33	33	33

Current RP 78 Recommended Survey Interval

Maximum Survey Interval [ft]		Planned DLS [deg/100ft MD]		
		< 1	1 – 5	> 5
SF [-]	> 2	200	100	33
	1.5 - 2	100	100	33
	< 1.5	33	33	33

Proposed RP 78 Recommended Survey Interval

Maximum Survey Interval [ft]	Planned DLS [deg/100ft MD]		
	< 2°/100ft Tangent	2° – 6°/100ft Long Radius	6°/100ft Medium Radius
SF > 4	Follow Regulatory Requirements (FRR)		
1.25 < SF < 4	200 ft or FRR	100 ft	100 ft
1 < SF < 1.25	100 ft	100 ft	Joint
SF < 1	100 ft	Joint	Joint

Survey Interval - Conclusion

- RP-78 Will adopt the proposed table of recommendations
- Ongoing investigation between Error Model and Collision Avoidance sub-committees

WPTS Standard Collision Avoidance Separation Rule

- Validation of magnitude values for Surface Margin & Project Ahead uncertainty – guidance

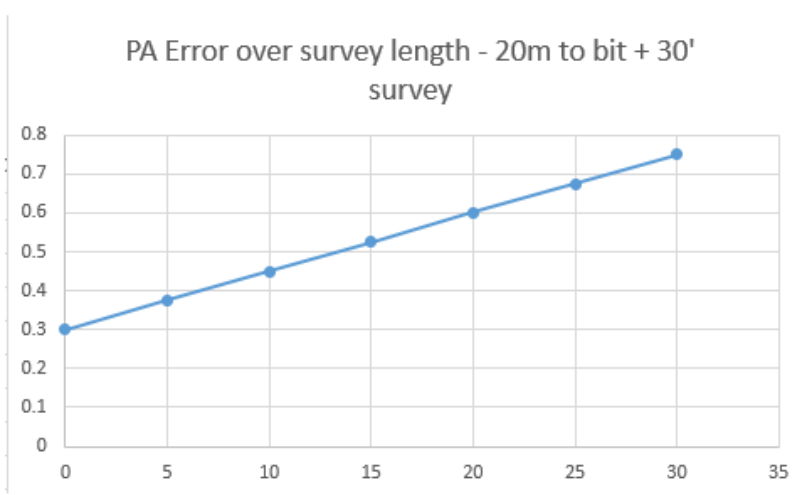
$$k = 3.5,\ S_m = 0.3\text{m and } \sigma_{pa} = 0.5\text{m}.$$

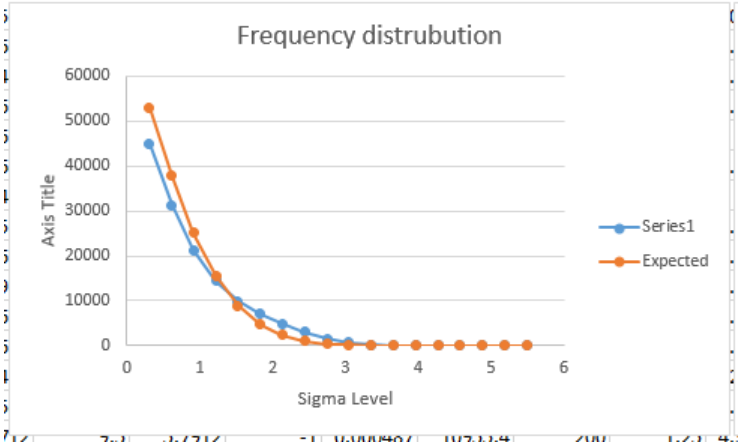
$$SF = \frac{D - R_r - R_o - S_m}{k\sqrt{\sigma_s^2 + \sigma_{pa}^2}}$$

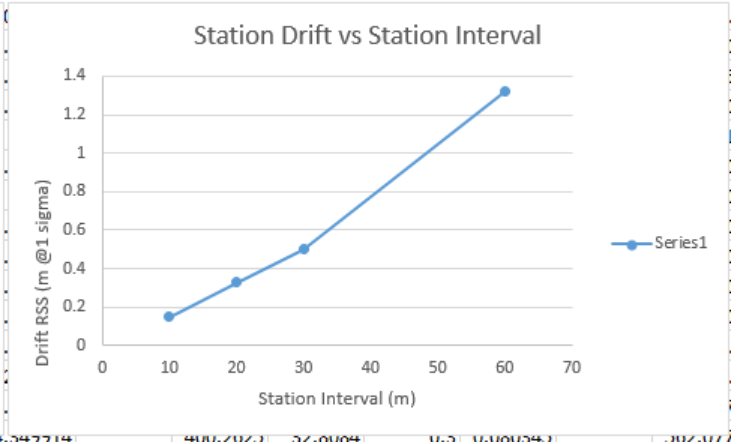
$$SF = \frac{D - R_r - R_o - 0.3}{3.5\sqrt{\sigma_s^2 + 0.25}}$$

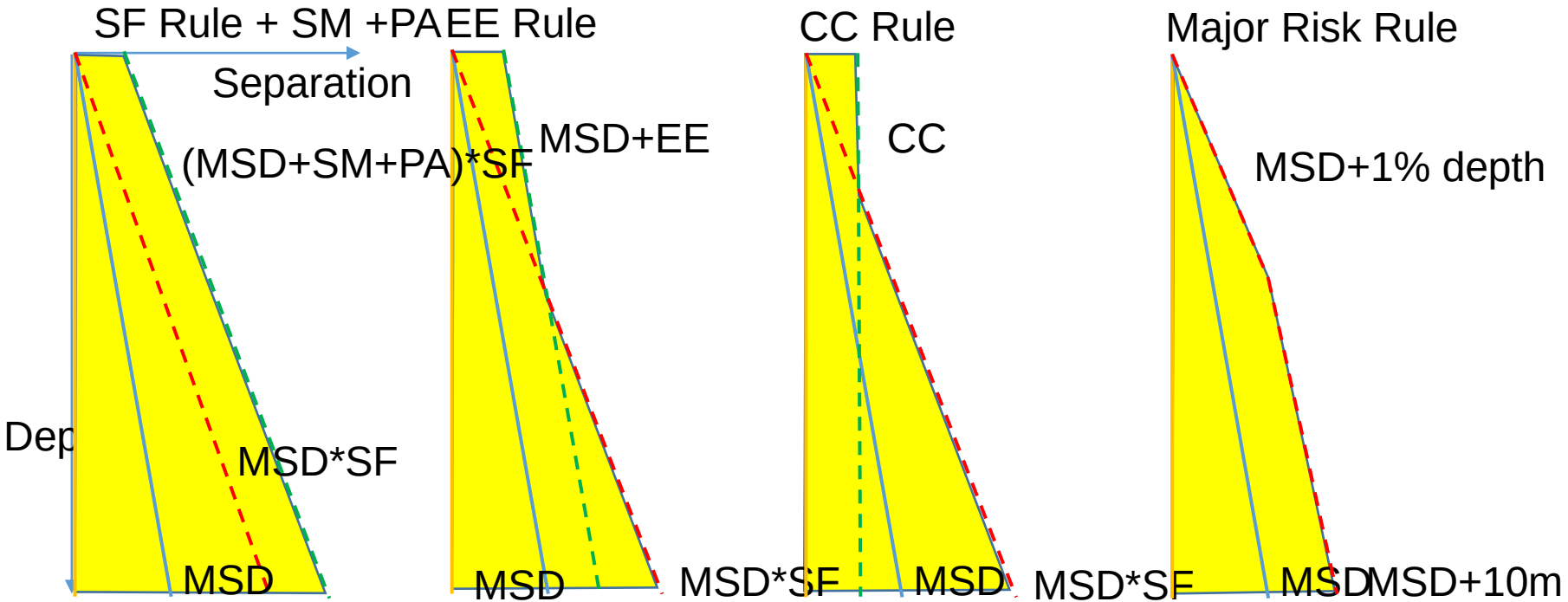
- Jerry Codling – Survey of Operators/Contractors Existing Rules – Surface Handling

- Value of 0.5m seems to be close to expected error for motor assembly and 90’ station intervals
- But can justify smaller values if using RSS (near bit sensors) and continuous or 30’ measurements









MSD=*k**(sum errors)+R1+R2

WPTS Standard Collision Avoidance Separation Rule

- Recommendation & Action - Create Addendum Document
  - Advise that standard rule can be used as-is if provided Sm/Pa constants work for your organization
  - Advise that Sm can be set to zero if used in conjunction with another means of accounting for surface collision avoidance mitigation
  - Advise the Pa value can be changed to a smaller value if specific operations use a smaller survey interval – as per chart
  - Continue with Zoom/Teams meeting to produce first draft – next 1-2 months

Collision Avoidance Reporting - Standardization

- Previous meeting (56/31 Houston) Defined 13 Columns
- This meeting (57/32 Stavanger) Start on Header items - 1 hr group effort
- Some questions on the addition of columns and possible deletion of some
- Will have some continued Zoom/Teams meetings

CA Reporting Nomenclature Standardization – WORK
(robust discussion)

#	Full Description of Column	Name	Short Name	Value Type
1	Reference Well Measured Depth	Reference MD	Ref MD	length / distance
2	Reference Well True Vertical Depth	Reference TVD	Ref TVD	length / distance
3	Offset Well Measured Depth	Offset MD	Off MD	length / distance
4	Offset Well True Vertical Depth	Offset TVD	Off TVD	length / distance
5	Centerline to Centerline Wellbore Proximity	Ct-to-Ct Distance	C-C	length / distance
6	Minimum Acceptable Separation Distance required to satisfy Collision Avoidance Rule	Minimum Allowable Separation Distance	MASD	length / distance
7	Separation Factor	Separation Factor	SF	unitless
8	Travelling Cylinder North Azimuth	Travelling Cylinder North Azimuth	TC Azi.	angle
9	Normal Plane Distance (Traveling Cylinder Plane)	Normal Plane Distance	TC Dist.	length / distance
10	Allowable Distance from Reference Well that will satisfy Collision Avoidance Rule	Allowable Deviation From Reference	ADR	length / distance
11	Orientation of Closest Approach relative to Reference Well's direction (Ahead/Behind)	Closest Approach Orientation	Ang	boolean (ahead/behind)
12	Collision Avoidance Rule Status (Pass/Fail)	CRA Status	Status	boolean
13	Collision Avoidance Action Criteria	Collision Avoidance Action	Action	free text
14	Active Rule	Active Rule		text
15	Probability Of Collision			

Thank You – Questions?