Thin Section Analysis Report

Sample ID: DN-29
Formation/Member Name: Gatesburg/Rose Run
Lithologic Classification: Carbonate
Depth/Depth Range: N/A
Date of Analysis: 6/12/2017
Analyzed by: S. Shank

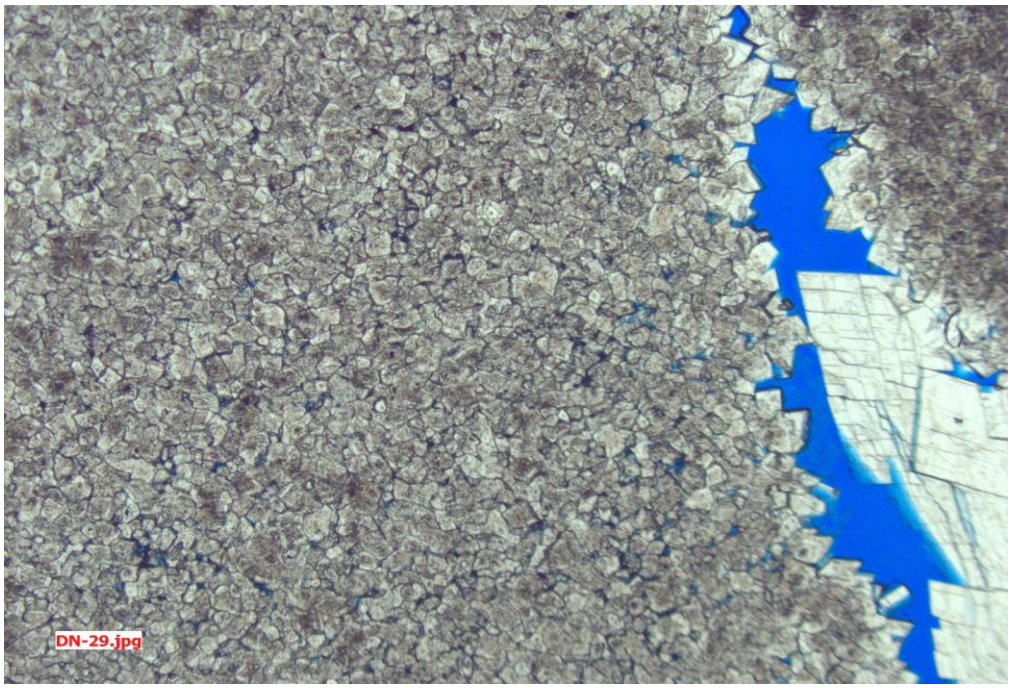
Texture		Comments
Grain Size		
Rounding		
Sorting		

Composition/Detrital Minerals		Comments
Quartz		
Polycrystalline		
Monocrystalline		
Microcrystalline		
Feldspar		
Plagioclase		
Orthoclase		
Microcline		
Carbonate		
Calcite		
Dolomite	100%	125-250µ, equigranular, recrystallized, very cloudy, common but discontinuous vugs with coarser carbonate rhombs and voids
Aragonite		
Clay		
Illite		
Smectite		
Kaolinite		
Muscovite		
Chlorite		
Glauconite		
Rock Fragments		
Sedimentary		
Volcanic		
Metamorphic		
Other (Accessory Minerals)		

Cementing Materials	Comments
Quartz	
Feldspar	
Carbonate	
Clay	
Iron Oxide, Hydoxide and/or Sulfide	
Other	

Visual Porosity Estimate	Comments
1%	
	almost all in or near vugs, virtually no porosity in matrix

25x magnification, 5mm field of view



Thin Section Analysis Report

Sample ID: DN-32
Formation/Member Name: Gatesburg/Rose Run
Lithologic Classification: Carbonate
Depth/Depth Range: N/A
Date of Analysis: 6/12/2017
Analyzed by: S. Shank

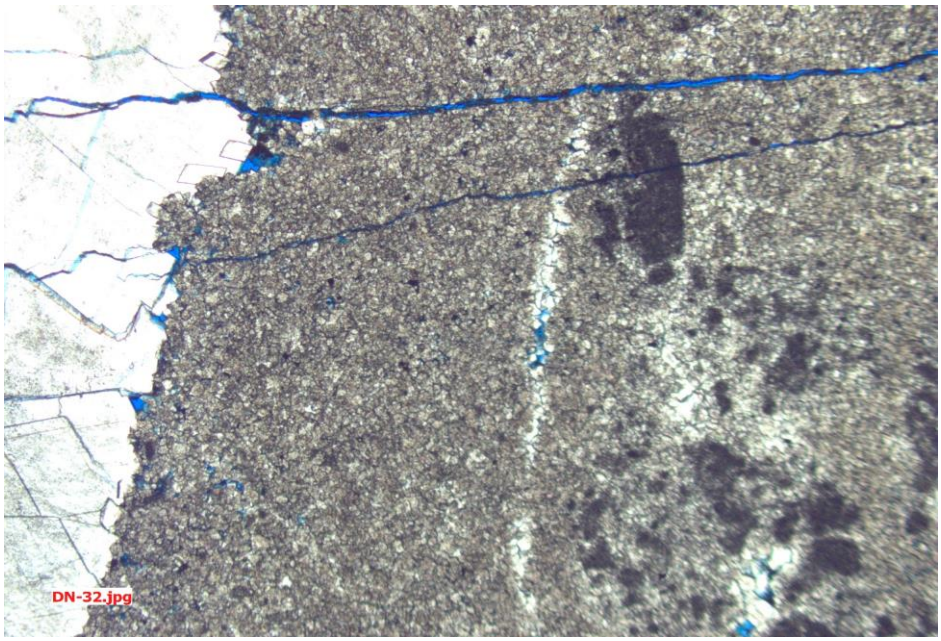
Texture		Comments
Grain Size		
Rounding		
Sorting		

Composition/Detrital Minerals		Comments
Quartz		
Polycrystalline		
Monocrystalline		
Microcrystalline		
Feldspar		
Plagioclase		
Orthoclase		
Microcline		
Carbonate		
Calcite		
Dolomite	100%	very fine-grained, <125µ, equigranular, recrystallized matrix, dolomite, very cloudy, large common vugs with coarse carbonate rhombs, rounded, extremely fine-grained patches - relic peloids?, dolomite?
Aragonite		
Clay		
Illite		
Smectite		
Kaolinite		
Muscovite		
Chlorite		
Glauconite		
Rock Fragments		
Sedimentary		
Volcanic		
Metamorphic		
Other (Accessory Minerals)		

Cementing Materials	Comments
Quartz	
Feldspar	
Carbonate	
Clay	
Iron Oxide, Hydoxide and/or Sulfide	
Other	

Visual Porosity Estimate	Comments
2%	porosity in vugs and thin fractures, almost no porosity in matrix

25x magnification, 5mm field of view



Thin Section Analysis Report

Sample ID:	DN-36
Formation/Member Name:	Gatesburg/Rose Run
Lithologic Classification:	Carbonate
Depth/Depth Range:	N/A
Date of Analysis:	6/13/2017
Analyzed by:	S. Shank

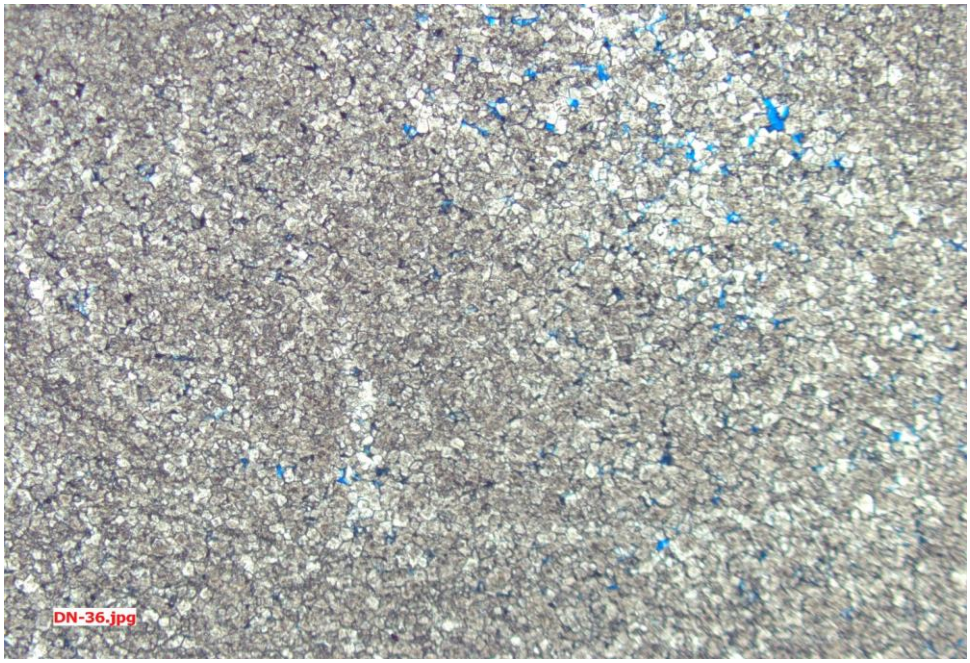
Texture		Comments
Grain Size		
Rounding		
Sorting		

Composition/Detrital Minerals		Comments
Quartz		
Polycrystalline		
Monocrystalline		
Microcrystalline		
Feldspar		
Plagioclase		
Orthoclase		
Microcline		
Carbonate		
Calcite		
Dolomite	100%	very fine-grained, <125, equigranular, recrystallized, clouded, dolomite? No vugs but a few small patches of slighly coarser carbonate
Aragonite		
Clay		
Illite		
Smectite		
Kaolinite		
Muscovite		
Chlorite		
Glauconite		
Rock Fragments		
Sedimentary		
Volcanic		
Metamorphic		
Other (Accessory Minerals)		

Cementing Materials	Comments
Quartz	
Feldspar	
Carbonate	
Clay	
Iron Oxide, Hydoxide and/or Sulfide	
Other	

Visual Porosity Estimate	Comments
2%	common, small intergranular, patchy distribution

25x magnification, 5mm field of view



Thin Section Analysis Report

Sample ID: DN-37
Formation/Member Name: Gatesburg/Rose Run
Lithologic Classification: Carbonate
Depth/Depth Range: N/A
Date of Analysis: 6/13/2027
Analyzed by: S. Shank

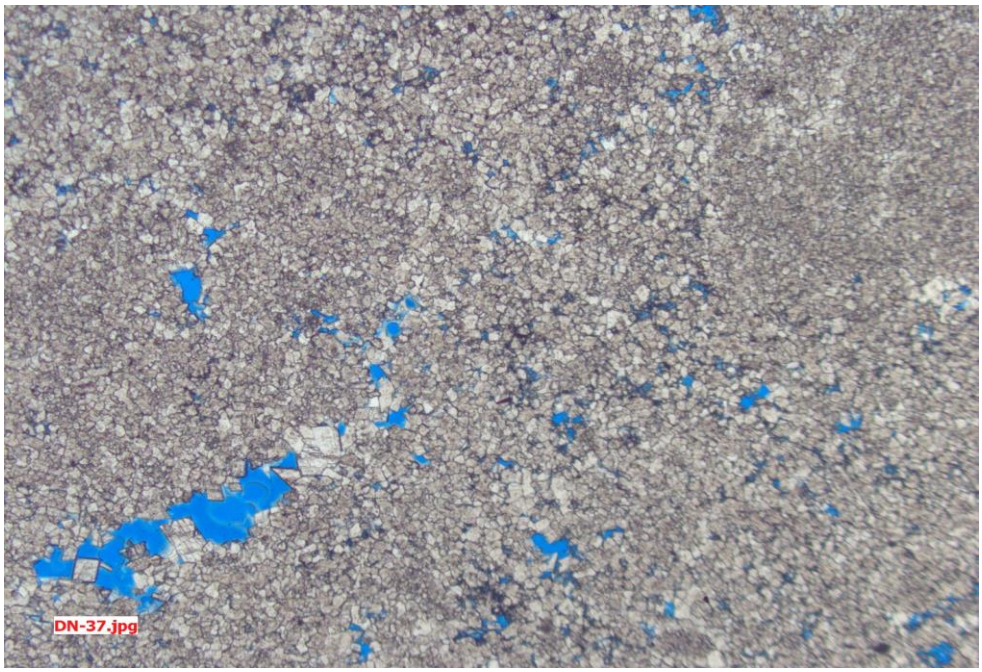
Texture		Comments
Grain Size		
Rounding		
Sorting		

Composition/Detrital Minerals		Comments
Quartz		
Polycrystalline		
Monocrystalline		
Microcrystalline		
Feldspar		
Plagioclase		
Orthoclase		
Microcline		
Carbonate		
Calcite		
Dolomite	100%	generally fine-grained with veins and patches of coarser carbonate, equigranular, recrystallized, clouded, dolomite?
Aragonite		
Clay		
Illite		
Smectite		
Kaolinite		
Muscovite		
Chlorite		
Glauconite		
Rock Fragments		
Sedimentary		
Volcanic		
Metamorphic		
Other (Accessory Minerals)		

Cementing Materials	Comments
Quartz	
Feldspar	
Carbonate	
Clay	
Iron Oxide, Hydoxide and/or Sulfide	
Other	

Visual Porosity Estimate	Comments
5%	common voids in vugs and common intergranular porosity

25x magnification, 5mm field of view



Thin Section Analysis Report

Sample ID: DN-38
Formation/Member Name: Gatesburg/Rose Run
Lithologic Classification: Carbonate
Depth/Depth Range: N/A
Date of Analysis: 6/13/2017
Analyzed by: S. Shank

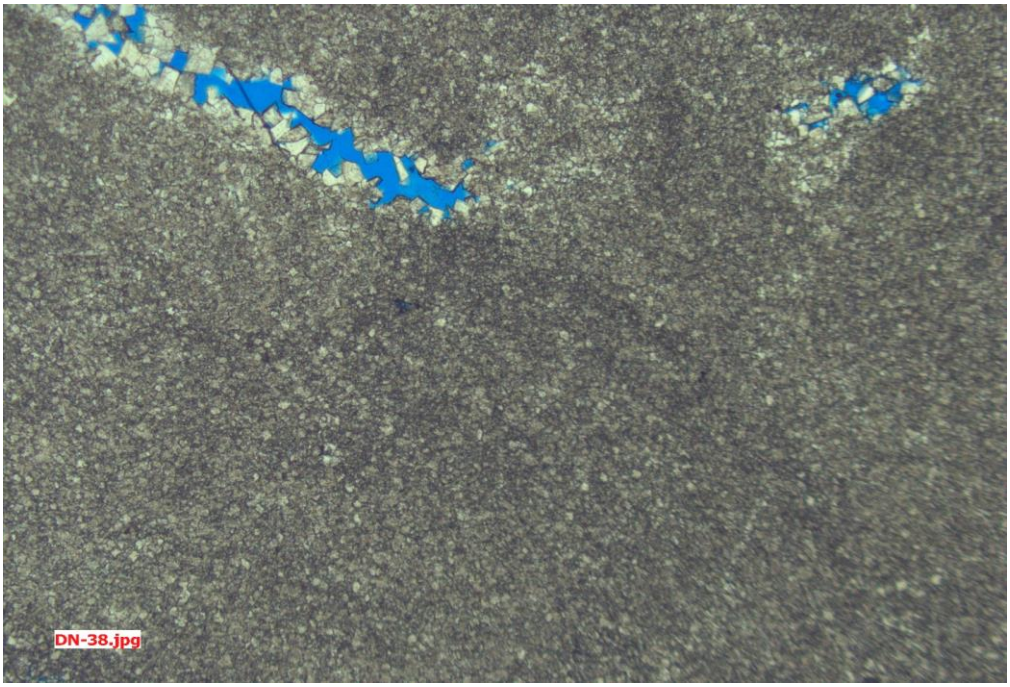
Texture		Comments
Grain Size		
Rounding		
Sorting		

Composition/Detrital Minerals		Comments
Quartz		
Polycrystalline		
Monocrystalline		
Microcrystalline		
Feldspar		
Plagioclase		
Orthoclase		
Microcline		
Carbonate		
Calcite		
Dolomite	100%	generally very fine-grained, <125µ, clouded, dolomite?, scattered, discontinuous vugs and veins of coarser carbonate rhombs and voids.
Aragonite		
Clay		
Illite		
Smectite		
Kaolinite		
Muscovite		
Chlorite		
Glauconite		
Rock Fragments		
Sedimentary		
Volcanic		
Metamorphic		
Other (Accessory Minerals)		

Cementing Materials	Comments
Quartz	
Feldspar	
Carbonate	
Clay	
Iron Oxide, Hydoxide and/or Sulfide	
Other	

Visual Porosity Estimate	Comments
2%	virtually no intergranular porosity, almost all in vugs and veins

25x magnification, 5mm field of view



Thin Section Analysis Report

Sample ID:	DN-40
Formation/Member Name:	Gatesburg/Rose Run
Lithologic Classification:	Dolostone
Depth/Depth Range:	N/A
Date of Analysis:	6/13/2017
Analyzed by:	S. Shank

Texture		Comments
Grain Size		
Rounding		
Sorting		

Composition/Detrital Minerals		Comments
Quartz		
Polycrystalline		
Monocrystalline		
Microcrystalline		
Feldspar		
Plagioclase		
Orthoclase		
Microcline		
Carbonate		
Calcite		
		fine to medium grained, <350µ, equigranular to irregular, recrystallized, cloudy dolomite.
Dolomite	100%	Dolomite confirmed by SEM.
Aragonite		
Clay		
Illite		
Smectite		
Kaolinite		
Muscovite		
Chlorite		
Glauconite		
Rock Fragments		
Sedimentary		
Volcanic		
Metamorphic		
Other (Accessory Minerals)		

Cementing Materials	Comments
Quartz	
Feldspar	
Carbonate	
Clay	
Iron Oxide, Hydoxide and/or Sulfide	
Other	

Visual Porosity Estimate		Comments
		scattered vugs, extremely limited
	2%	intergranular porosity

Thin Section Analysis Report

Sample ID:	DN-41
Formation/Member Name:	Gatesburg/Rose Run
Lithologic Classification:	Carbonate
Depth/Depth Range:	N/A
Date of Analysis:	6/13/2017
Analyzed by:	S. Shank

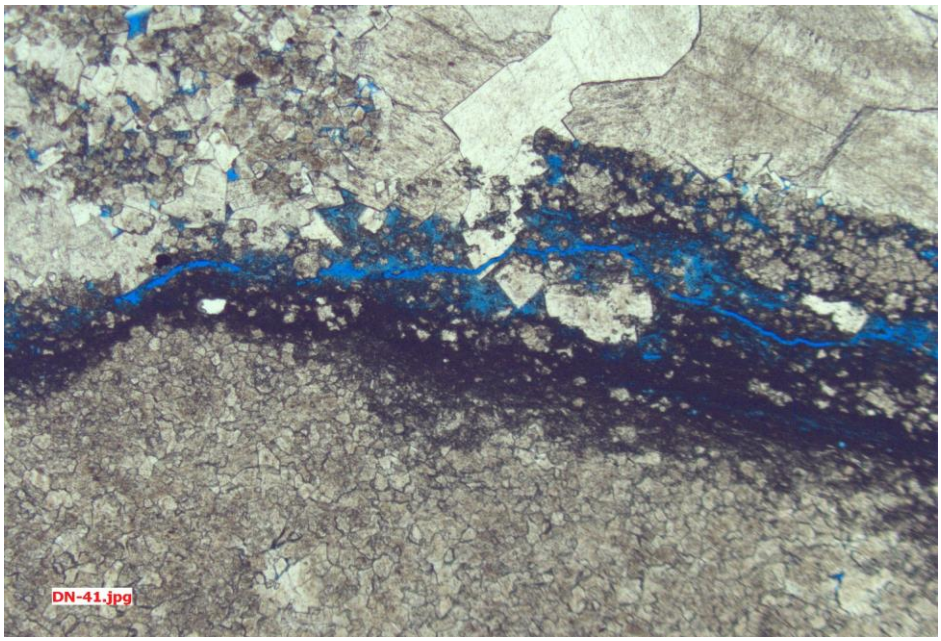
Texture		Comments
Grain Size		
Rounding		
Sorting		

Composition/Detrital Minerals		Comments
Quartz		
Polycrystalline		
Monocrystalline		
Microcrystalline		
Feldspar		
Plagioclase		
Orthoclase		
Microcline		
Carbonate		
Calcite		
Dolomite	100%	very fine to fine-grained matrix, cloudy, <125µ, with large vugs filled with coarse carbonate. Few thin veins.
Aragonite		
Clay		
Illite		
Smectite		
Kaolinite		
Muscovite		
Chlorite		
Glauconite		
Rock Fragments		
Sedimentary		
Volcanic		
Metamorphic		
Other (Accessory Minerals)		

Cementing Materials	Comments
Quartz	
Feldspar	
Carbonate	
Clay	
Iron Oxide, Hydoxide and/or Sulfide	
Other	

Visual Porosity Estimate	Comments
1%	scattered voids in vugs and veins, minimal porosity in matrix

25x magnification, 5mm field of view



Thin Section Analysis Report

Sample ID: DN-42
Formation/Member Name: Gatesburg/Rose Run
Lithologic Classification: Carbonate
Depth/Depth Range: N/A
Date of Analysis: 6/15/2017
Analyzed by: S. Shank

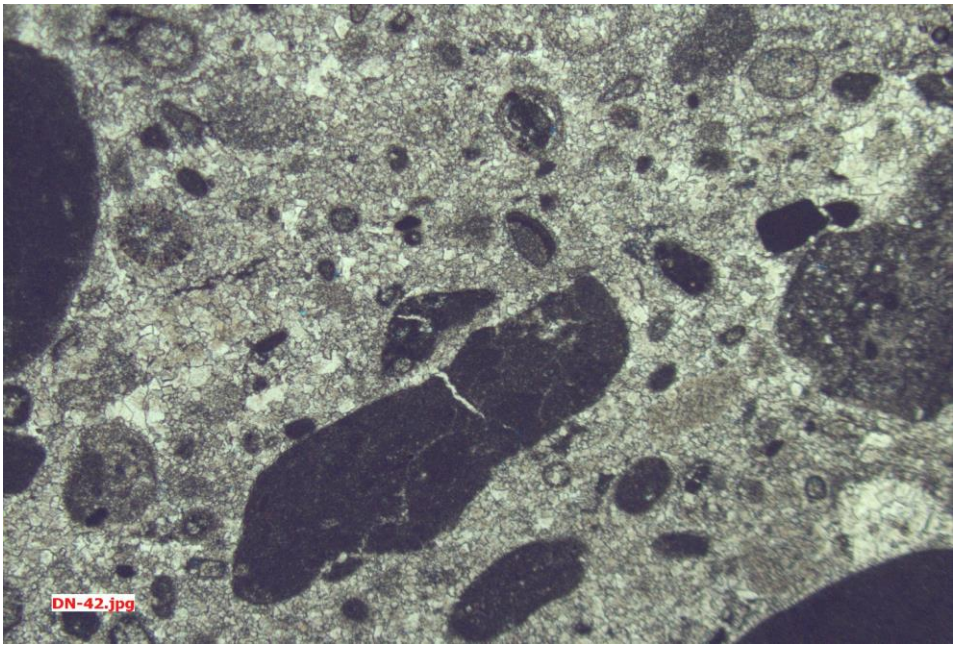
Texture		Comments
Grain Size		
Rounding		
Sorting		

Composition/Detrital Minerals		Comments
Quartz		
Polycrystalline		
Monocrystalline		
Microcrystalline		
Feldspar		
Plagioclase		
Orthoclase		
Microcline		
Carbonate		
Calcite		
Dolomite	100%	abundant allochems, clasts, relic ooids, peloids? in recrystallized cloudy very fine-grained, <125µ, matrix. Dolomite?
Aragonite		
Clay		
Illite		
Smectite		
Kaolinite		
Muscovite		
Chlorite		
Glauconite		
Rock Fragments		
Sedimentary		
Volcanic		
Metamorphic		
Other (Accessory Minerals)		

Cementing Materials	Comments
Quartz	
Feldspar	
Carbonate	
Clay	
Iron Oxide, Hydoxide and/or Sulfide	
Other	

Visual Porosity Estimate	Comments
<<1%	No porosity observed except for small discontinuous fracture

25x magnification, 5mm field of view



Thin Section Analysis Report

Sample ID:	DN-43
Formation/Member Name:	Gatesburg/Rose Run
Lithologic Classification:	Carbonate
Depth/Depth Range:	N/A
Date of Analysis:	6/16/2017
Analyzed by:	S. Shank

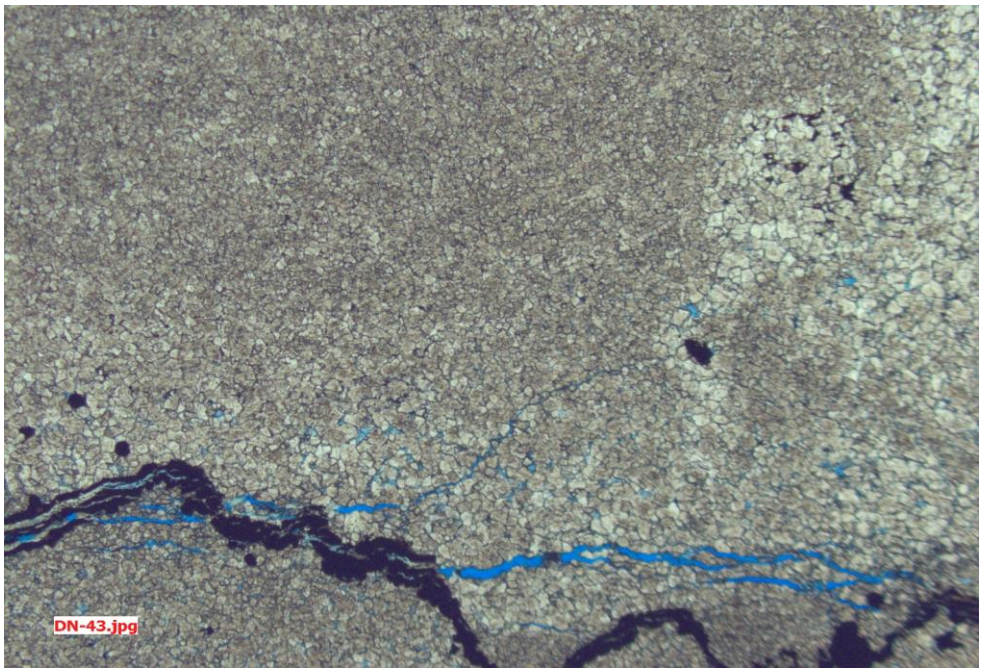
Texture		Comments
Grain Size		
Rounding		
Sorting		

Composition/Detrital Minerals		Comments
Quartz		
Polycrystalline		
Monocrystalline		
Microcrystalline		
Feldspar		
Plagioclase		
Orthoclase		
Microcline		
Carbonate		
Calcite		
Dolomite	100%	very fine-grained, <125µ, recrystallized, cloudy dolomite?, with scattered coarser patches and veins. Cut by thin stylolites and subparallel fracture
Aragonite		
Clay		
Illite		
Smectite		
Kaolinite		
Muscovite		
Chlorite		
Glauconite		
Rock Fragments		
Sedimentary		
Volcanic		
Metamorphic		
Other (Accessory Minerals)		
	<1% opaques	scattered grains and in stylolites

Cementing Materials	Comments
Quartz	
Feldspar	
Carbonate	
Clay	
Iron Oxide, Hydoxide and/or Sulfide	
Other	

Visual Porosity Estimate	Comments
<1%	virtually no intergranular porosity in very fine-grained matrix, thin fracture along stylolite and scattered porosity in coarser grained patches

25x magnification, 5mm field of view



Thin Section Analysis Report

Sample ID: DN-45
Formation/Member Name: Gatesburg/Rose Run
Lithologic Classification: Breccia
Depth/Depth Range: N/A
Date of Analysis: 6/16/2017
Analyzed by: S. Shank

Texture		Comments
Grain Size		matrix supported breccia with angular clasts (~1 cm) of chert and silicified oolites in carbonate
Rounding		
Sorting		

Composition/Detrital Minerals		Comments
Quartz		
Polycrystalline		
Monocrystalline	<1%	
		few scattered sand grains in silicified oolites and carbonate matrix
Microcrystalline		
Feldspar		
Plagioclase		
Orthoclase		
Microcline		
Carbonate		
Calcite		
Dolomite		
Aragonite		
Clay		
Illite		
Smectite		
Kaolinite		
Muscovite		
Chlorite		
Glauconite		
Rock Fragments		
Sedimentary	75%	chert and silicified oolites
Volcanic		
Metamorphic		
Other (Accessory Minerals)		

Cementing Materials		Comments
Quartz		
Feldspar		
Carbonate	25%	very fine-grained, <125µ, equigranular to rhombic cloudy carbonate, some rhombs of carbonate in silicified oolites
Clay		
Iron Oxide, Hydoxide and/or Sulfide		
Other		

Visual Porosity Estimate	Comments
<1%	extremely limited porosity in very thin veins, fractures along clast margins and scattered voids

25x magnification, 5mm field of view

