VOLUME 5: TABLE OF CONTENTS

AUTHORSHIP

ABBREVIATIONS AND ACRONYMS

DEFINITIONS

34 Asserted or Established Aboriginal and Treaty Rights, Aboriginal Interests, and Information Requirements 34-1

34.1 Aboriginal Groups 34-1

34.2 Aboriginal Groups Background Information 34-2

34.3 Asserted or Established Aboriginal and Treaty Rights 34-2
34.3.1 Past, Current, and Reasonably Anticipated Future Use of Lands and Resources 34-2
34.3.2 Asserted or Established Aboriginal Rights and Treaty Rights 34-2
34.3.2.1 Treaty 8 Rights 34-2
34.3.2.2 Aboriginal Rights – Non-treaty First Nations 34-7
34.3.2.3 Aboriginal Rights – Métis Groups 34-9
34.3.3 Assessment of Potential Impacts on the Exercise of Asserted or Established Aboriginal and Treaty Rights 34-11

34.4 Aboriginal Accommodation 34-18
34.4.1 Summary of Mitigation Measures for Potential Adverse Impacts on the Exercise of Asserted or Established Aboriginal and Treaty Rights 34-18
34.4.2 Summary of Mitigation Measures Suggested by Aboriginal Groups 34-20
34.4.3 Summary of Environmental Mitigation Measures that Serve to Mitigate Impacts on the Exercise of Asserted or Established Aboriginal or Treaty Rights 34-21
34.4.4 Other Accommodations 34-22

34.5 Outstanding Aboriginal Issues 34-22

34.6 Other Interests of Aboriginal Groups 34-23
34.6.1 Aboriginal Interests: Social, Economic, Health, Physical, and Cultural Heritage Effects of the Project 34-23
34.6.2 Consideration of Effects on Identified Interests in Assessment of Potential Effects on VCs or Otherwise 34-23
34.6.3 Proponent's Approach to Building Capacity 34-24
34.6.3.1 BC Hydro Aboriginal Procurement Policy 34-24
34.6.3.2 Capacity Building 34-24
34.6.3.3 Engagement with Aboriginal Businesses 34-27

34.7 Aboriginal Consultation and Engagement 34-27
34.7.1 Impact Benefit Agreements 34-27
34.7.2 Consultation and Engagement Methods 34-28

34.8 Aboriginal Summary 34-29

References 34-30

Cases 34-30

Literature Cited 34-30

Internet Sites 34-30

Personal Communications 34-31

Statutes and Treaties 34-31

35 Summary of Environmental Management Plans 35-1

35.1 Environmental Management Framework 35-1
35.1.1 Environmental Management Plans 35-1
35.1.2 Environmental Oversight 35-2

35.2 Construction Phase 35-3
35.2.1 Construction Safety Management Plans 35-3
35.2.1.1 Emergency Response Plan 35-3
35.2.1.2 Fire Hazard and Abatement Plan 35-4
35.2.1.3 Public Safety Management Plan 35-5
35.2.1.4 Traffic Management Plan 35-6
35.2.1.5 Worker Safety and Health Management Plan 35-7
35.2.2 Construction Environmental Management Plans 35-8
35.2.2.1 Acid Rock Drainage-Metal Leachate Management Plan 35-8
35.2.2.2 Air Quality Management Plan 35-8
35.2.2.3 Blasting Management Plan 35-9
35.2.2.4 Borrow and Quarry Sites Reclamation Plan 35-10
35.2.2.5 Construction Communication Plan 35-10
35.2.2.6 Contaminated Sites Management Plan 35-10
35.2.2.7 Dust Control Plan 35-11
35.2.2.8 Environmental Training Management Plan 35-11
35.2.2.9 Erosion Prevention and Sediment Control Plan 35-11
35.2.2.10 Fisheries and Aquatic Habitat Management Plan 35-13
35.2.2.11 Fuel Handling and Storage Management Plan 35-14
35.2.2.12 Groundwater Protection Plan 35-15
35.2.2.13 Hazardous Waste Management Plan 35-16
35.2.2.14 Heritage Resources Management Plan 35-17
35.2.2.15 Ice Management Plan 35-18
35.2.2.16 Noise and Vibration Management Plan 35-18
35.2.2.17 Project Vegetation, Clearing, and Debris Management Plan 35-19
35.2.2.18 Smoke Management Plan 35-20
35.2.2.19 Soil Management, Site Restoration, and Revegetation Plan 35-21
35.2.2.20 Solid Waste Management Reduction and Recycling Plan 35-22
35.2.2.21 Surface Water Quality Management Plan 35-22
35.2.2.22 Vegetation and Invasive Plant Management Plan 35-22
35.2.2.23 Waste Management Plan 35-23
35.2.2.24 Wildlife Management Plan 35-24

35.3 Operations Phase 35-25
35.3.1 Operations Safety Management Plans 35-26
35.3.1.1 Emergency Response Plan 35-26
35.3.1.2 Public Safety Management Plan 35-27
35.3.1.3 Reservoir Shoreline Monitoring and Management Plan 35-28
35.3.1.4 Worker Safety and Health Management Plan 35-28
35.3.2 Operations Environmental Management Plans 35-29
35.3.2.1 Hazardous Waste Management Plan 35-29
35.3.2.2 Ice Management Plan 35-29
35.3.2.3 Materials Management Plan 35-30
35.3.2.4 Vegetation and Invasive Plant Management Plan 35-30
35.3.2.5 Waste Management Plan 35-31
35.3.2.6 Water Management Plan 35-32

References 35-33
Literature Cited 35-33
Internet Sites 35-33

36 Compliance Reporting 36-1
36.1 Environmental Monitors 36-1
36.2 Environmental Officers 36-2
36.2.1 Environmental Monitoring Plan 36-2

37 Requirements for the Federal Environmental Assessment 37-1
37.1 Effects of the Environment on the Project 37-2
37.1.1 Introduction 37-2
37.1.2 Environmental Data 37-3
37.1.2.1 Climate Data 37-3
37.1.2.2 Flow Data 37-3
37.1.2.3 Seismic Data 37-4
37.1.3 Extreme Weather Events 37-4
37.1.3.1 Dam, Generating Station, and Spillways 37-4
37.1.3.1.1 Wind 37-4
37.1.3.1.2 Rain 37-6
37.1.3.1.3 Ice 37-7
37.1.3.1.4 Low Temperatures 37-7
37.1.3.2 Transmission Line and Substation 37-8
37.1.3.3 Highway 29 Realignment and Other Roads 37-8
37.1.3.4 Hudson's Hope Shoreline Protection 37-9
37.1.4 Drought 37-9
37.1.5 Sedimentation of the Reservoir 37-9
37.1.6 Seismic Activity 37-10
37.1.6.1 Dam, Generating Station, and Spillways 37-10
37.1.6.1.1 Lessons Learned from Major Earthquakes 37-10
~~37.1.7~~ Concrete Dams 37-10
~~37.1.8~~ Earthfill Dams 37-12
37.1.6.1.2 ~~8.1.1~~ Performance Requirements 37-13
37.1.6.1.3 ~~8.1.2~~ Earthfill Dam Performance 37-14
37.1.6.1.4 ~~8.1.3~~ North Bank Performance 37-16
37.1.6.1.5 ~~8.1.4~~ RCC Buttress Performance 37-17
37.1.6.1.6 ~~8.1.5~~ Other Reservoir Retaining Structures 37-20
37.1.6.1.7 ~~8.1.6~~ Post-Earthquake Monitoring 37-20
37.1.6~~8~~.2 Transmission Line and Substation 37-20
37.1.6~~8~~.3 Highway 29 Realignment and Other Roads 37-21
37.1.6~~8~~.4 Hudson's Hope Shoreline Protection 37-21
37.1.7~~9~~ Wildfire 37-21
37.1.8~~10~~ Floods During Construction 37-21
37.1.8.1 ~~10.1~~ Site C Local Catchment Floods 37-22
37.1.8.2 ~~10.2~~ Stage 1 – River Channelization 37-23
37.1.8.3 ~~10.3~~ Stage 2 – River Diversion 37-23
37.1.8.4 ~~10.4~~ Highway 29 Realignment and Other Roads 37-24
37.1.9~~11~~ Floods During Operation 37-25
37.1.9.1 ~~11.1~~ Probable Maximum Precipitation 37-25
37.1.9.1.1 ~~11.1.1~~ Methodology 37-25

37.1.9.1.2 ~~11.1.2~~ Climate Data 37-26
37.1.9.1.3 ~~11.1.3~~ Storm Separation Method 37-27
37.1.9.1.4 ~~11.1.4~~ 100-Year 24-Hour Precipitation Map 37-28
37.1.9.1.5 ~~11.1.5~~ 100-Year 24-Hour Convergence Precipitation Map 37-28
37.1.9.1.6 ~~11.1.6~~ Development of T/C Map 37-29
37.1.9.1.7 ~~11.1.7~~ Historical Storm Analysis 37-29
37.1.9.1.8 ~~11.1.8~~ Storm Maximization 37-30
37.1.9.1.9 ~~11.1.9~~ Storm Transposition 37-30
37.1.9.1.10 ~~11.1.10~~ Dominant Storms 37-31
37.1.9.1.11 ~~11.1.11~~ Probable Maximum Precipitation 37-31
37.1.9.2 ~~11.2~~ Probable Maximum Flood 37-33
37.1.9.2.1 ~~11.2.1~~ Scenarios 37-33
37.1.9.2.2 ~~11.2.2~~ Snowpack 37-34
37.1.9.2.3 ~~11.2.3~~ Rainfall 37-35
37.1.9.2.4 ~~11.2.4~~ Critical Temperature Sequences 37-36
37.1.9.2.5 ~~11.2.5~~ Watershed Model 37-37
37.1.9.2.6 ~~11.2.6~~ Probable Maximum Flood 37-38
37.1.9.3 ~~11.3~~ Likelihood 37-40
37.1.10 ~~12~~ Slope Stability and Mass Wasting Events 37-41
37.1.10.1 ~~12.1~~ Dam Site Slope Stability 37-42
37.1.10.2 ~~12.2~~ Reservoir Shoreline Stability 37-43
37.1.10.3 ~~12.3~~ Landslide-Generated Waves 37-44
37.1.10.4 ~~12.4~~ Transmission Line 37-45
37.1.11 ~~13~~ Climate Change 37-45
37.1.11.1 ~~13.1~~ Electricity Generation 37-46
37.1.11.2 ~~13.2~~ Floods 37-46
37.2 Potential Accidents and Malfunctions 37-47
37.2.1 Introduction 37-47
37.2.2 Dam Breach Analyses 37-48
37.2.2.1 Data and Methodology 37-48
37.2.2.1.1 Bathymetric and Topographic Data 37-49
37.2.2.1.2 Hydrometric Data 37-49
37.2.2.1.3 Hydrodynamic Model Development and Calibration 37-50
37.2.2.1.4 Dam Breach Parameters 37-51
37.2.2.2 Failure of the Stage 2 Upstream Cofferdam 37-51
37.2.2.2.1 Scenarios 37-51
37.2.2.2.2 Results 37-52
37.2.2.3 Failure of the Earthfill Dam 37-54
37.2.2.3.1 Scenarios 37-54
37.2.2.3.2 Results 37-56
37.2.2.3.3 Downstream Extent of Studies 37-59
37.2.2.4 Measures to Reduce Likelihood or Mitigate Potential Occurrence of a Dam Breach 37-60
37.2.2.4.1 Inflow Flood Forecasting and Flood Warning 37-60
37.2.2.4.2 Spillway Gate Reliability 37-61
37.2.2.4.3 Debris management 37-62
37.2.2.4.4 Powerhouse Operation 37-63
37.2.2.4.5 Increasing Cofferdam Freeboard 37-64
37.2.2.4.6 Earthquake Design 37-64
37.2.2.4.7 Sunny Day Failure Due to Piping 37-64
37.2.3 Potential Accidents and Malfunctions During Construction 37-65
37.2.3.1 Release or Spills of Chemicals or Hazardous Materials 37-65

37.2.3.2 Containment Pond Leakage or Failure 37-66
37.2.3.3 Sediment Control Failure 37-66
37.2.3.4 Fire and Explosion 37-66
37.2.4 Potential Accidents and Malfunctions During Operation 37-67
37.2.4.1 Release or Spills of Chemicals or Hazardous Materials 37-67
37.2.4.1.1 Overview 37-67
37.2.4.1.2 Worst Case Oil Spill 37-69
37.2.4.1.3 Release of SF6 Gas 37-70
37.2.4.2 Fire and Explosion 37-71
37.2.4.3 Transmission Line or Generating Station Outage 37-72
37.2.5 Effects of Accidents and Malfunctions on Valued Components 37-73
37.2.5.1 Construction Phase 37-73
37.2.5.1.1 Breach of Stage 2 Upstream Cofferdam 37-73
37.2.5.1.2 Fire of Explosion 37-74
37.2.5.2 Operations Phase 37-75
37.2.5.2.1 Breach of Earthfill Dam 37-75
37.2.5.2.2 Release or spills of chemical and hazardous materials 37-76
37.2.5.2.3 Fire or Explosion 37-76

37.3 Cumulative Environmental Effects 37-76
37.3.1 Approach to Assessment of Cumulative Effects of the Project 37-76
37.3.1.1 The Boundaries of the RAA for Each VC 37-77
37.3.1.2 The Three Cases 37-78
37.3.1.3 The Project Inclusion List 37-79
37.3.2 Description of Potential Cumulative Effects 37-80
37.3.3 Identification of Mitigation Measures 37-80
37.3.4 Characterization of Cumulative Residual Effects 37-80
37.3.5 Determination of Significance of Cumulative Residual Effects 37-81
37.3.6 Summary of the Potential Cumulative Effects of the Project 37-81

37.4 Capacity of Renewable Resources 37-82
37.4.1 Effects of the Project on VCs that Contain, or Pertain to, Renewable Resources 37-82
37.4.2 Project Beneficial Use of Renewable Resources 37-84

37.5 Requirements of Any Follow-Up Programs 37-84

References 37-85

Literature Cited 37-85

Internet Sites 37-87

38 Summary of Potential Residual Effects of The Project 38-1

39 Complete Lists of Mitigation and Follow-Up Measures 39-1

40 Conclusion and Conditions 40-1

40.1 The Proponent, BC Hydro 40-1
40.2 The Project Components and Activities 40-1
40.3 The Assessment Process 40-2
40.4 Need for the Project 40-2
40.5 Alternatives to the Project 40-3

40.6 Purpose of the Project 40-3
40.7 Alternative Means of Carrying out the Project 40-3
40.8 Information Distribution and Consultation 40-3
40.9 Technical Studies 40-4
40.10 The Valued Components 40-4
40.11 Assessment of the Potential Effects and Cumulative Effects of the Project 40-5
40.12 Impact to the Exercise of Treaty Rights 40-6
40.13 Follow up Program 40-6
40.14 Environmental, Economic, Social, and Sustainability Benefits 40-6
40.15 Justification of the Potential Significant Adverse Effects 40-6
40.16 Issuance of a Decision Statement and Environmental Assessment Certificate, with Conditions 40-8

List of Tables

Table 34.1 Aboriginal Groups Potentially Adversely Affected by the Project 34-1
Table 34.2 Mitigation Measures for Potential Adverse Impacts on the Exercise of Treaty Rights 34-19
Table 37.1 Federal Requirements for the Environmental Assessment of the Project 37-1
Table 37.2 Freeboard Requirements for Wind Effects 37-6
Table 37.3 Scaled Earthquake Records 37-19
Table 37.4 Flood Frequency Analysis Results 37-22
Table 37.5 Precedents (Current Canadian Practice) for the Selection of Floods for the Design of Diversion Works and Cofferdams 37-23
Table 37.6 Application of the Dominating Storms Over the Basins 37-32
Table 37.7 Probable Maximum Snow Accumulation (cm) Over the Williston Catchment 37-34
Table 37.8 Probable Maximum Snow Accumulation (cm) Over the Site C Local Catchment 37-34
Table 37.9 100-Year Snow Water Equivalent (mm) for Williston Sub-Basin 37-35
Table 37.10 100-Year Snow Water Equivalent (mm) for Site C Sub-Basin 37-35
Table 37.11 100-Year Three-Day Summer Rainfall Distribution on Site C Local Catchment 37-35
Table 37.12 100-Year Three-Day Spring Rainfall Distribution on Site C Local Catchment 37-36
Table 37.13 Site C Probable Maximum Flood Scenarios 37-40
Table 37.14 Inundation Modelling Results for 50-Year Flood (No Cofferdam) with 50-Year Tributary Inflows 37-52
Table 37.15 Inundation Modelling Results for 50-Year Flood with Cofferdam and 50-Year Tributary Inflows 37-53
Table 37.16 Inundation Modelling Results for the Stage 2 Upstream Cofferdam Overtopping with 50-Year Tributary Inflows 37-54
Table 37.17 Inundation Modelling Results for the Stage 2 Upstream Cofferdam Overtopping with Average June Tributary Inflows 37-54
Table 37.18 Inundation Modelling Results for the Sunny Day Failure Scenario 37-56
Table 37.19 Inundation Modelling Results for the Probable Maximum Flood without the Project 37-57
Table 37.20 Inundation Modelling Results for the Probable Maximum Flood with the Project 37-57
Table 37.21 Inundation Modelling Results for the Overtopping of the Earthfill Dam 37-58
Table 37.22 Regional Assessment Areas 37-77
Table 37.23 Screening Criteria Used to Identify Other Projects and Activities For Consideration in the Cumulative Effects Assessment 37-79
Table 37.24 Summary of the Potential Cumulative Effects of the Project 37-81
Table 37.25 Summary of Consideration of Renewable Resources Within the EIS 37-83
Table 38.1 Summary of Potential Residual Effects of the Project 38-2
Table 38.2 Summary of Effects on Federal Considerations 38-26
Table 39.1 Complete List of Mitigation Measures 39-2
Table 39.2 Complete List of Follow-Up Measures 39-27

List of Figures

Figure 35.1 Environmental Management Framework
Figure 36.1 Environmental Oversight Program
Figure 37.1 Locations of meteorological stations
Figure 37.2 Northbridge Earthquake Scaled to 0.25 g
Figure 37.3 Natural Resources Canada 2009 Fire Danger Ratings
Figure 37.4 Natural Resources Canada 1959 Through 1999 Forest Fire Ignition Causes
Figure 37.5 Hydrograph Shapes
Figure 37.6 Routing of the June 2001 Flood Through the Diversion Tunnels
Figure 37.7 100-Year 24-Hour Total Summer Precipitation
Figure 37.8 100-Year 24-Hour Summer Convergence Precipitation
Figure 37.9 Ratios of Total Precipitation to Convergence Precipitation
Figure 37.10 Summer/Fall Probable Maximum Precipitation Over Williston Catchment
Figure 37.11 Summer/Fall Probable Maximum Precipitation Over Site C Local Catchment
Figure 37.12 30-Day Critical Temperature Sequences for Site C Local Catchment
Figure 37.13 45-Day Critical Temperature Sequences for Site C Local Catchment
Figure 37.14 Site C Local Catchment
Figure 37.15 UBC Watershed Model Calibration
Figure 37.16 Site C Local Catchment Spring Probable Maximum Flood – Scenario 1
Figure 37.17 Site C Local Catchment Spring Probable Maximum Flood – Scenario 2
Figure 37.18 Site C Local Catchment Summer Probable Maximum Flood – Scenario 3
Figure 37.19 1996 Temperature Sequence
Figure 37.20 Site C Local Catchment Spring Probable Maximum Flood – Scenario 4
Figure 37.21 Site C Probable Maximum Flood With Summer Probable Maximum Precipitation Centred Over Site C
Figure 37.22 Interaction of Potential Accidents and Malfunction on Valued Components

List of Appendices

Appendix A Asserted or Established Aboriginal Rights and Treaty Rights, Aboriginal Interests and Information Requirements Supporting Documentation (29 in total)

Appendix B Additional Supporting Documentation: Site C: Preliminary Historical Research Report

Appendix C Dene Tha' First Nation Supplement to Current Use of Lands for Traditional Purposes

Appendix D Correspondence: from Treaty 8 Tribal Association to BC Hydro Site C EA Team re: T8FNs Site C TLUS Cultural Sites Narrative Dated June 14, 2013