Keeyask Generation Project

Environmental Impact Statement

Response to EIS Guidelines

KEEYASK

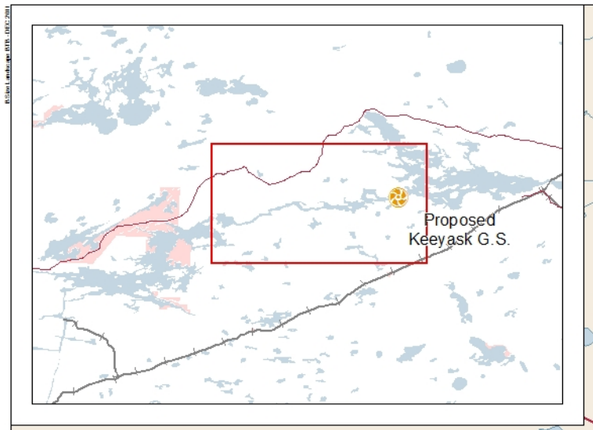
Hydropower Limited Partnership

June 2012

CHAPTER 6

ENVIRONMENTAL EFFECTS ASSESSMENT

KEEYASK
Hydropower Limited Partnership



Note: Shows year 30 shoreline Extents of dewatered area are estimated based on the existing environment 95th percentile flow. Map illustrates the estimated extent of dewatered area when the spillway is not in operation. The true extent of this area is uncertain due to the limited bathymetric data.

KEEYASK
Hydropower Limited Partnership

DATA SOURCE:
Manitoba Hydro, North/South Consultants, Government of Canada
gull-ee-95perc-4327cms-rev3

CREATED BY:
North/South Consultants

COORDINATE SYSTEM: UTM NAD 1983 Z15N

DATE CREATED: 26-MAR-10

REVISION DATE: 23-MAY-12

0 1.5 3 Kilometres
0 1 2 Miles

VERSION NO: 3.0

QA/QC: PMC/FSV/MWZ

Legend

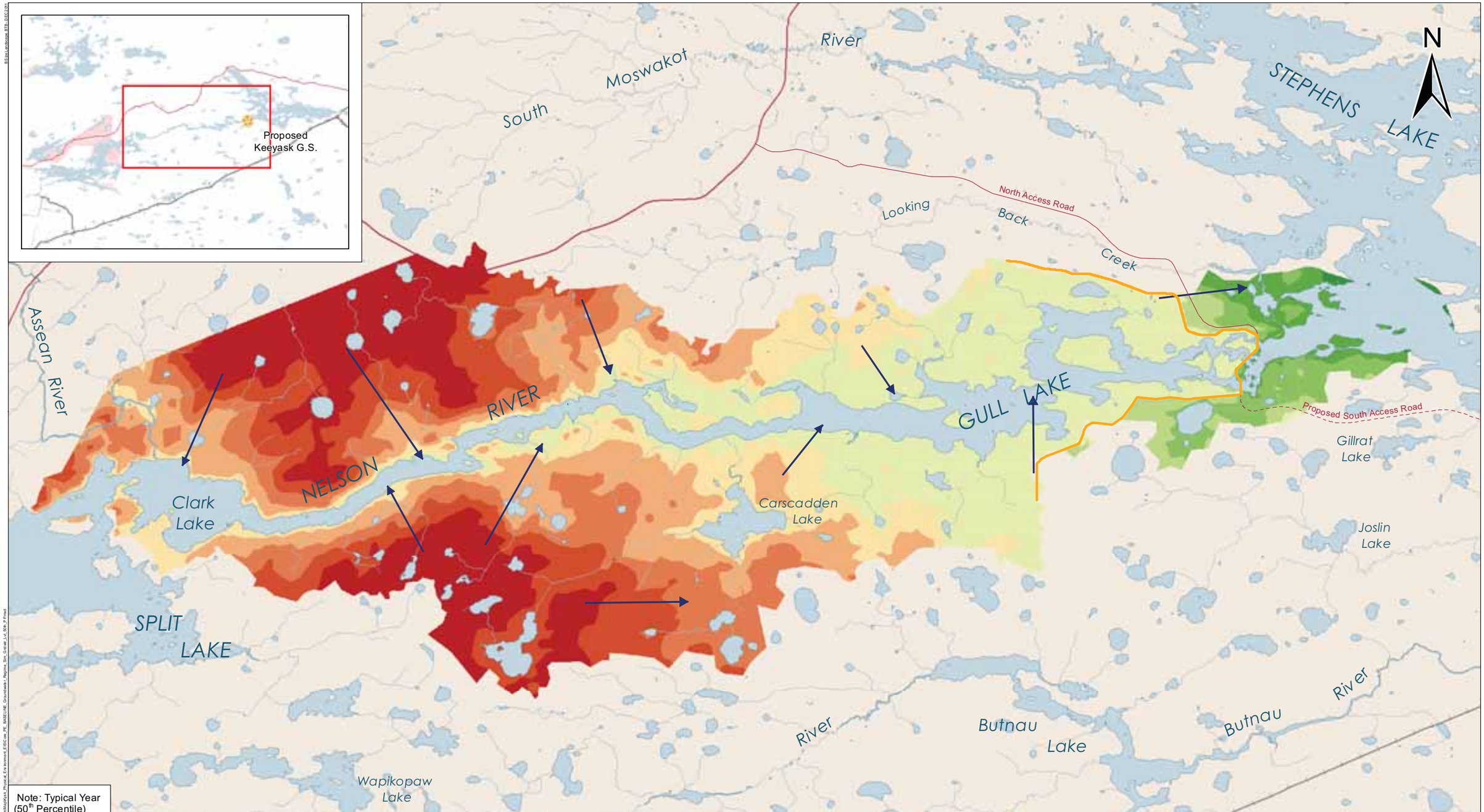
Substrate

- Bedrock
- Boulder
- Cobble/Boulder/Bedrock
- Cobble/Boulder
- Cobble
- Cobble/Gravel
- Clay
- Gravel
- Gravel/Sand
- Sand
- Sandy Clay
- Silt
- Silt/Clay
- Organic
- Flooded Terrestrial Soils
- Peat
- No Data
- Potential Dewatered Area
- Keeyask Principal Structures

Substrate Post-Project

Year 30 Keeyask Area

Map 6-53



KEEYASK
Hydropower Limited Partnership

DATA SOURCE:
Manitoba Hydro, NTS, Stantec Consulting Ltd.

CREATED BY:
Stantec Consulting Ltd.

COORDINATE SYSTEM:	DATE CREATED:	REVISION DATE:
UTM NAD 1983 Z15N	18-JUL-11	15-MAY-12
0 1.5 3 Kilometres / 0 1 2 Miles	VERSION NO: 1.0	QA/QC: APPROVED

Legend

Groundwater Elevation (m)

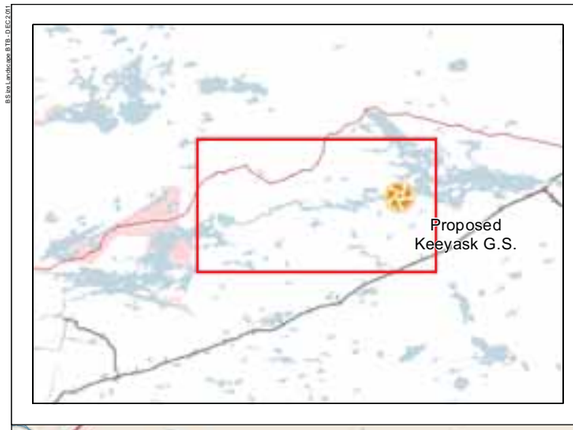
- < 140
- 140 - 146
- 146 - 152
- 152 - 158
- 158 - 164
- 164 - 170
- 170 - 176
- 176 - 182
- 182 - 188
- > 188

- Groundwater Flow Direction
- Keeyask Principal Structures
- Proposed Access Road
- Access Road
- Waterbody

Groundwater Regime

Simulated Groundwater Level
(Post Project)

Map 6-54



Note: Increase in Groundwater Elevation Affected Terrestrial Area = 17.94 km^2
Typical Year (50th Percentile)

KEEYASK
Hydropower Limited Partnership

DATA SOURCE:
Manitoba Hydro, NTS, Stantec Consulting Ltd.

CREATED BY:
Stantec Consulting Ltd.

COORDINATE SYSTEM:	DATE CREATED:	REVISION DATE:
UTM NAD 1983 Z15N	16-SEP-11	15-MAY-12
0 1.5 3 Kilometres / 0 1.5 3 Miles	VERSION NO: 1.0	QA/QC: APPROVED

Legend

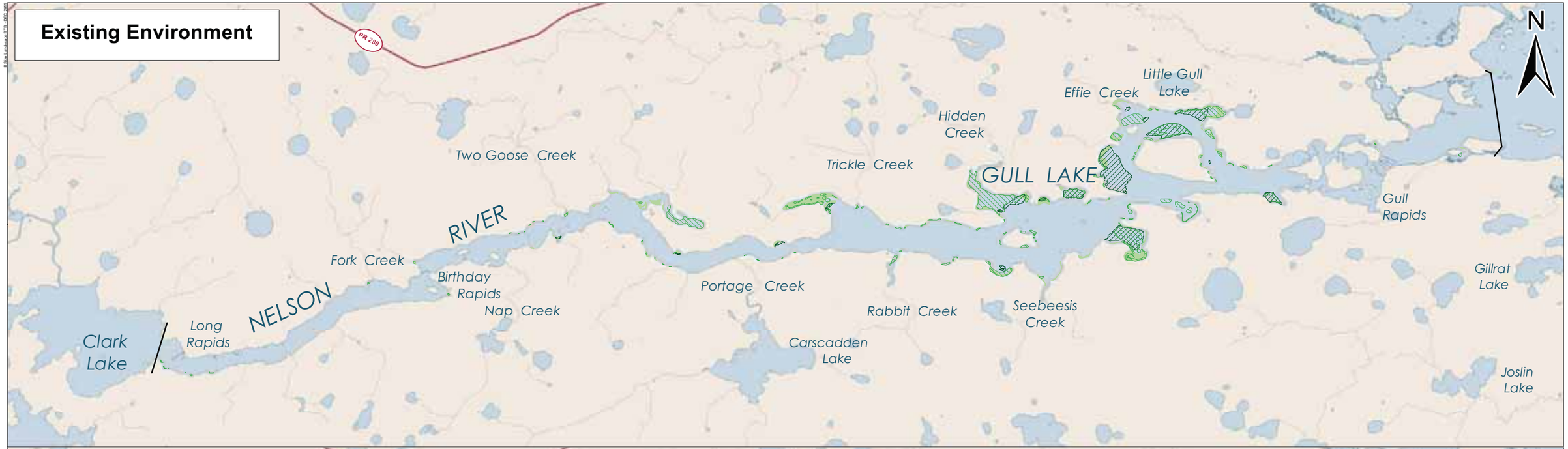
- Existing Waterbody
- Projected Extent of Initial Flooding Area
- Terrestrial Area Where Groundwater Levels Are Predicted To Be Affected
- Keeyask Principal Structures
- Proposed Access Road
- Access Road

Groundwater Regime

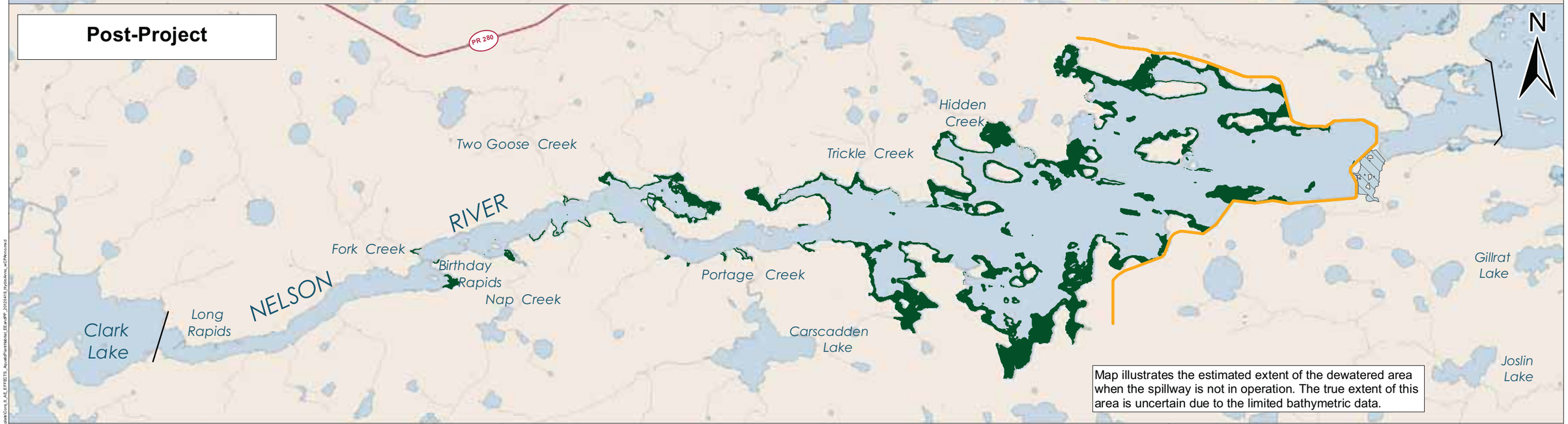
Predicted Future Change in Groundwater Regime

Map 6-55

Existing Environment



Post-Project



KEEYASK Hydropower Limited Partnership

DATA SOURCE:
Manitoba Hydro, North/South Consultants, Government of Canada
gull-ee-95perc-4327cms-rev3, pp-95perc-4327-159-shore-rev5

CREATED BY:
North/South Consultants

COORDINATE SYSTEM:	DATE CREATED:	REVISION DATE:
UTM NAD 1983 Z15N	26-MAR-10	30-MAY-12
0 2 4 Kilometres / 0 1 2 Miles	VERSION NO: 2.0	QA/QC: APPROVED

Legend

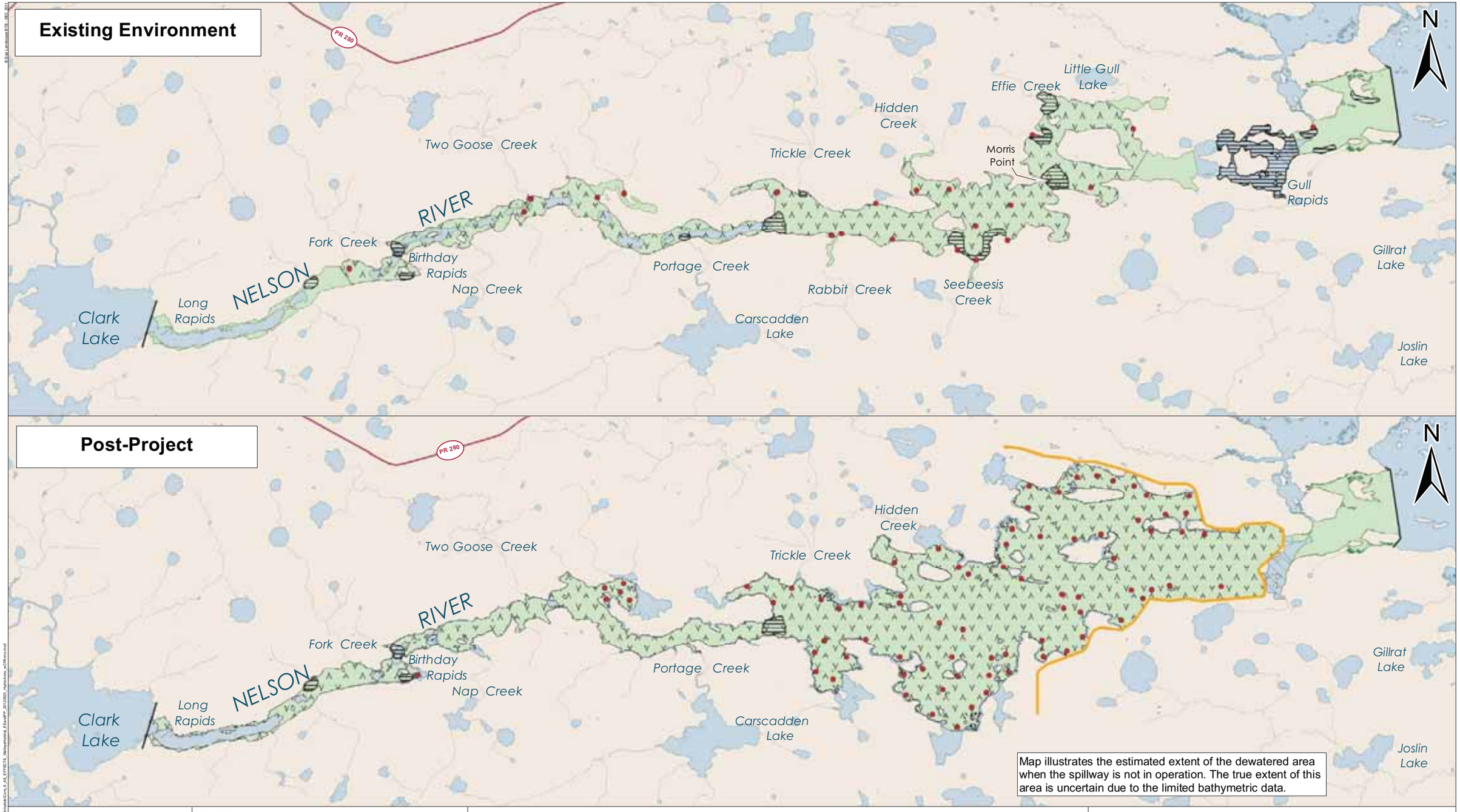
- 2001 Aquatic Plant Bed
- 2003 Aquatic Plant Bed
- 2006 Aquatic Plant Bed
- Post-Project Aquatic Plant Habitat
- Potential Dewatered Area
- Keeyask Principal Structures
- Clark Lake to Stephens Lake Area Boundary

Note: Post-Project frame shows Year 30 habitat - aquatic plant beds not expected to cover entire area. Extents of dewatered area are estimated based on the existing environment 95th percentile flow.

Aquatic Plant Habitat

Map 6-56

File Location: G:\EE\Keeyask\Publish, LM30\CORE_VOLUME 6\...\Update\...\Template\Core_6_AE_EFFECTS_AquaticPlantHabitat_EE.aprx® 20120419 HydroArrivo_wCPAmo.mxd



KEEYASK Hydropower Limited Partnership

DATA SOURCE:
Manitoba Hydro, North/South Consultants, Government of Canada
gull-ee-95perc-4327cms-rev3, pp-95perc-4327-159-shore-rev5

CREATED BY:
North/South Consultants

COORDINATE SYSTEM:	DATE CREATED:	REVISION DATE:
UTM NAD 1983 Z15N	26-MAR-10	24-MAY-12
0 2 4 Kilometres / 0 1 2 Miles	VERSION NO: 3.0	QA/QC: APPROVED

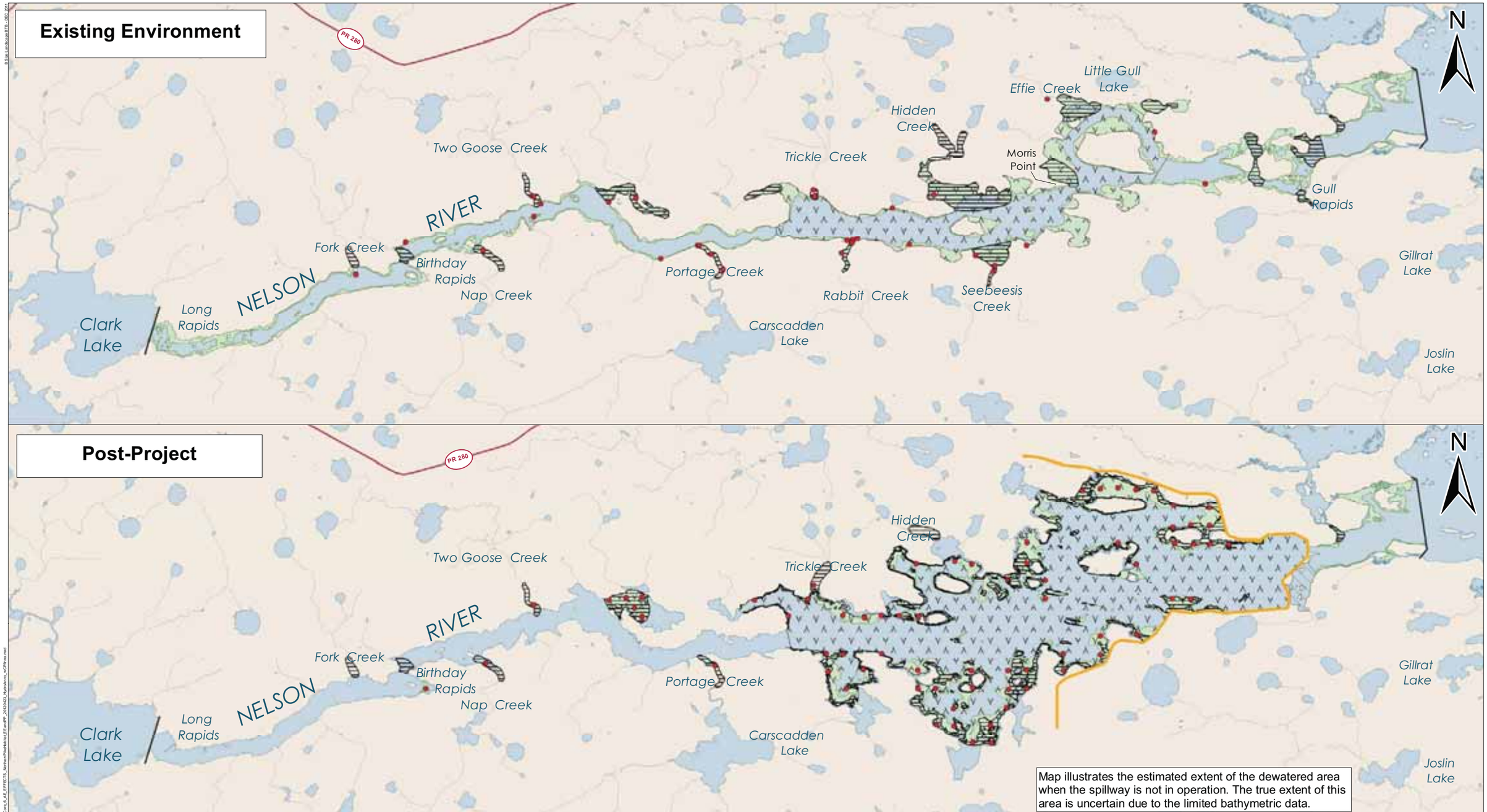
Legend

- Rearing
- Spawning
- Foraging
- Overwintering
- Potential Dewatered Area
- Keeyask Principal Structures
- Clark Lake to Stephens Lake Area Boundary

Note: Existing Environment and Post-Project frames show 95th percentile inflow. Extents of dewatered area are estimated based on the existing environment 95th percentile flow. Mitigation measures are not shown

Walleye Habitat

Map 6-57



KEEYASK Hydropower Limited Partnership

DATA SOURCE:
Manitoba Hydro, North/South Consultants, Government of Canada
gull-ee-95perc-4327cms-rev3, pp-95perc-4327-159-shore-rev5

CREATED BY:
North/South Consultants

COORDINATE SYSTEM:	DATE CREATED:	REVISION DATE:
UTM NAD 1983 Z15N	26-MAR-10	24-MAY-12
0 2 4 Kilometres / 0 1 2 Miles	VERSION NO: 3.0	QA/QC: APPROVED

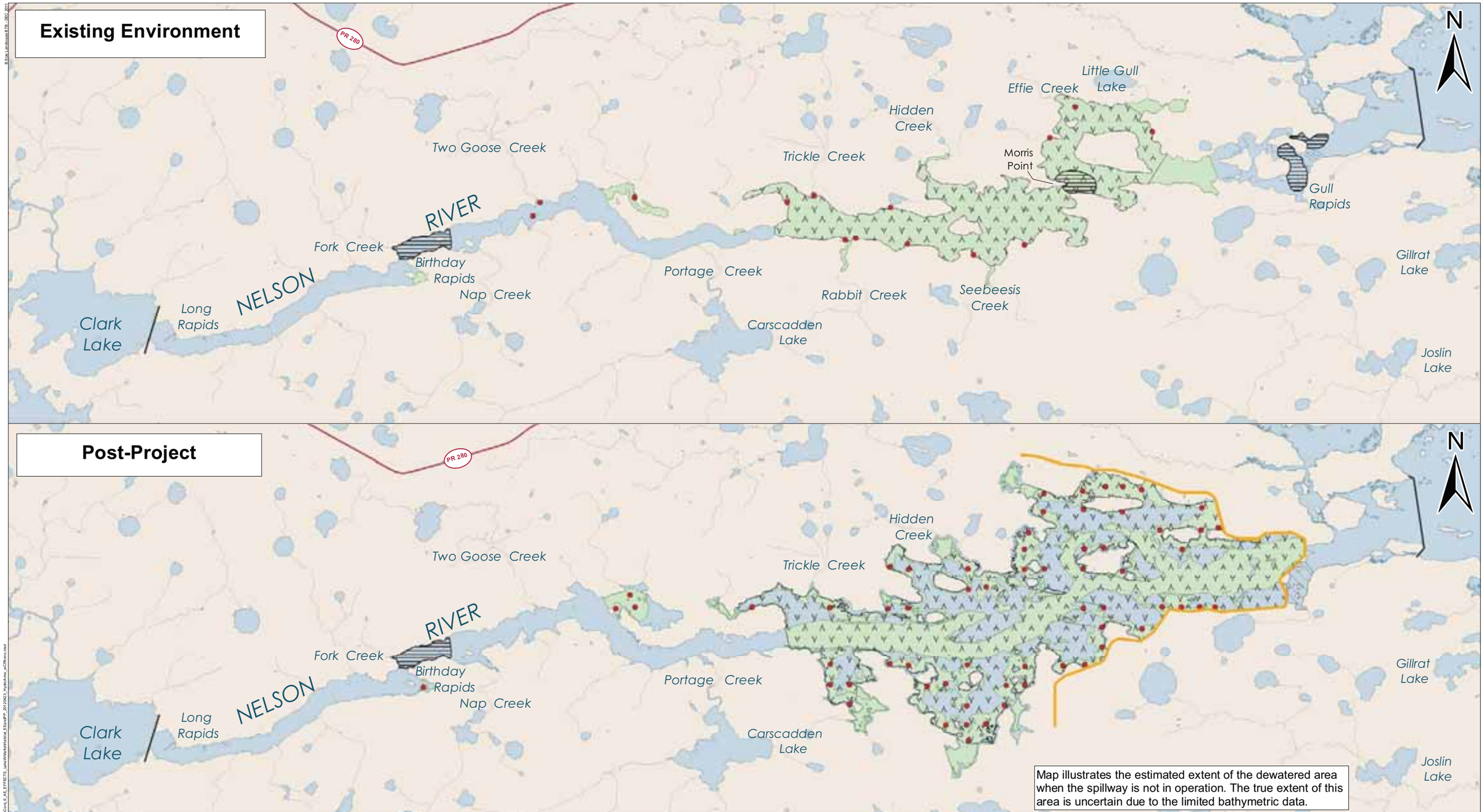
Legend

- Rearing
- Spawning
- Foraging
- Overwintering
- Potential Dewatered Area
- Keeyask Principal Structures
- Clark Lake to Stephens Lake Area Boundary

Note: Existing Environment and Post-Project frames show 95th percentile inflow. Extents of dewatered area are estimated based on the existing environment 95th percentile flow. Mitigation measures are not shown

Northern Pike Habitat

Map 6-58



KEEYASK Hydropower Limited Partnership

DATA SOURCE:
Manitoba Hydro, North/South Consultants, Government of Canada
gull-ee-95perc-4327cms-rev3, pp-95perc-4327-159-shore-rev5

CREATED BY:
North/South Consultants

COORDINATE SYSTEM:	DATE CREATED:	REVISION DATE:
UTM NAD 1983 Z15N	26-MAR-10	24-MAY-12
0 2 4 Kilometres / 0 1 2 Miles	VERSION NO: 3.0	QA/QC: APPROVED

Legend

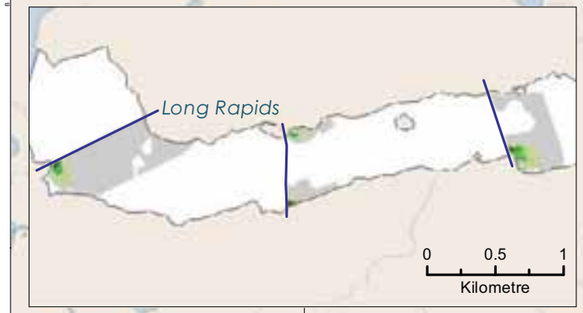
- Rearing
- Spawning
- Foraging
- Overwintering
- Potential Dewatered Area
- Keeyask Principal Structures
- Clark Lake to Stephens Lake Area Boundary

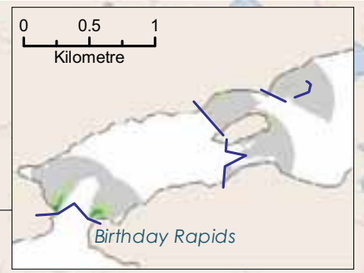
Note: Existing Environment and Post-Project frames show 95th percentile inflow. Extents of dewatered area are estimated based on the existing environment 95th percentile flow. Mitigation measures are not shown

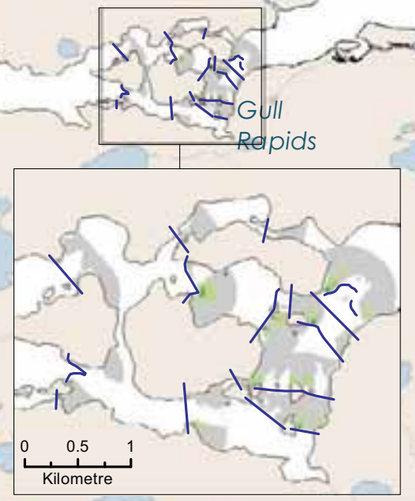
Lake Whitefish Habitat

Map 6-59

Existing Environment



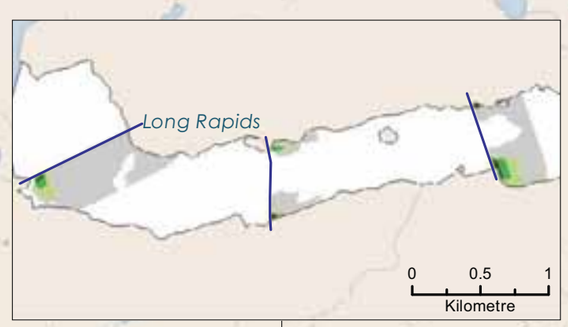


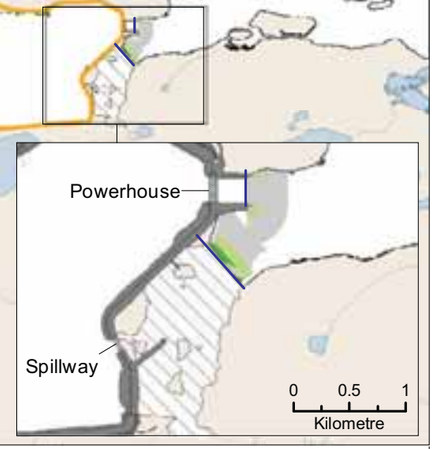


RIVER
NELSON
Clark Lake
Carscadden Lake
GULL LAKE
Caribou Island
Gull Rapids
PR 280
N

Post-Project

Map illustrates the estimated extent of the dewatered area when the spillway is not in operation. The true extent of this area is uncertain due to the limited bathymetric data.





RIVER
NELSON
Clark Lake
Birthday Rapids
Carscadden Lake
N

KEEYASK Hydropower Limited Partnership

DATA SOURCE:
Manitoba Hydro, North/South Consultants, Government of Canada
gull-ee-95perc-4327cms-rev3, pp-95perc-4327-159-shore-rev5

CREATED BY:
North/South Consultants

COORDINATE SYSTEM:	DATE CREATED:	REVISION DATE:
UTM NAD 1983 Z15N	26-MAR-10	22-JUN-12
0 2 4 Kilometres / 0 1 2 Miles	VERSION NO: 4.0	QA/QC: APPROVED

Legend

Habitat Suitability Index

- 0.00
- 0.01 - 0.25
- 0.25 - 0.50
- 0.50 - 0.75
- 0.75 - 1.00

- Potential Dewatered Area
- Keeyask Principal Structures
- Hydraulic Feature

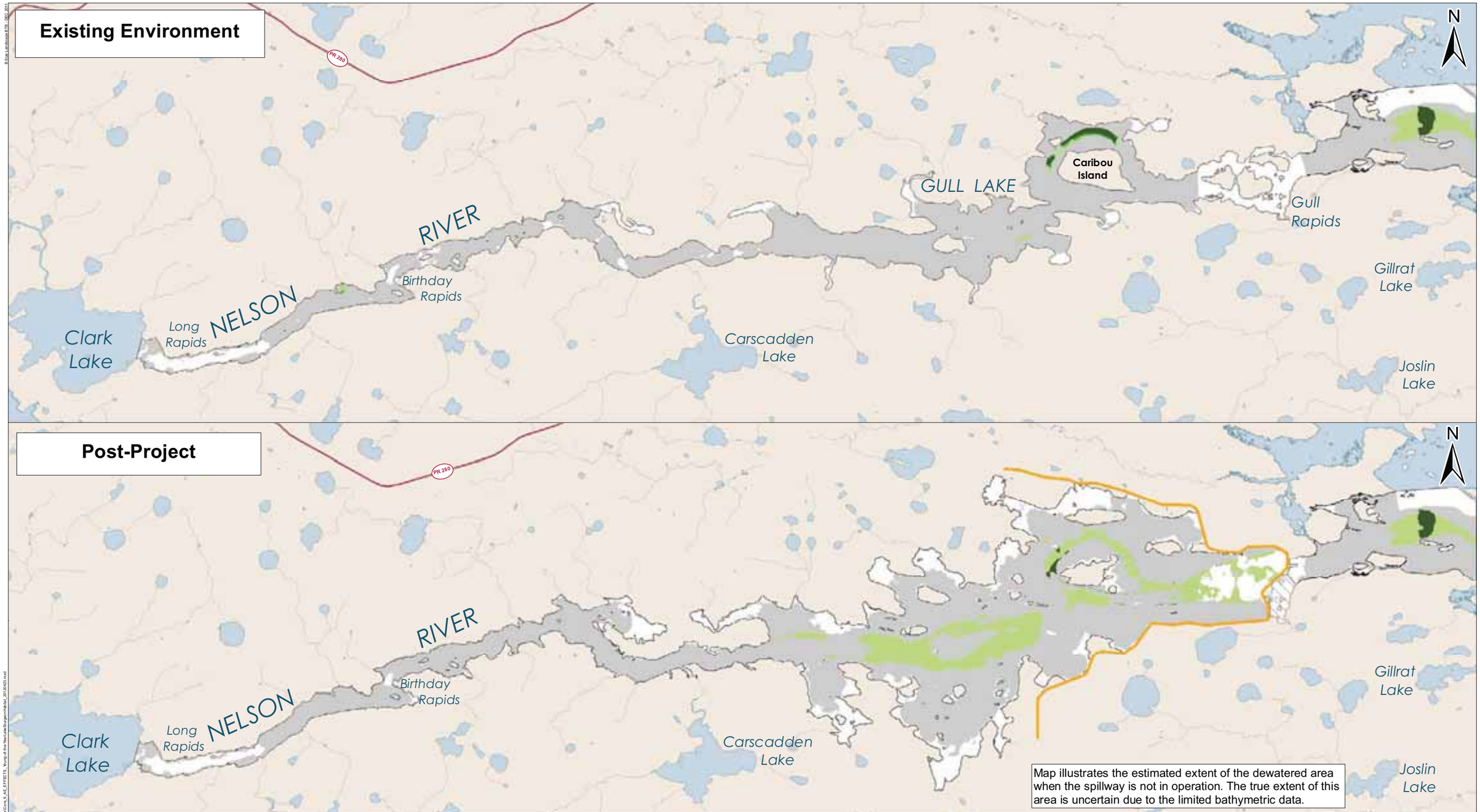
Note: Existing Environment frame shows 95th percentile inflow and Stephens Lake level of 141.1m. Post-Project frame shows Year 30 shoreline, reservoir at 159 metres and 95th percentile inflow with 7 unit full gate plant operation with spill and Stephens Lake level of 141.1m. Mitigation measures are not shown. Extents of dewatered area are estimated based on the existing environment 95th percentile flow.

Lake Sturgeon Spawning Habitat

Five Variable Habitat Suitability Index Model Output

Map 6-60

File Location: G:\EIS\Keeyask\Portals\...\Updated_Templates\Core_6_AE_EFFECTS_Lake Sturgeon\Spawning\Habitat\Habitat Layout\...



KEEYASK Hydropower Limited Partnership

DATA SOURCE:
Manitoba Hydro, North/South Consultants, Government of Canada
gull-ee-95perc-4327cms-rev3, pp-95perc-4327-159-shore-rev5

CREATED BY:
North/South Consultants

COORDINATE SYSTEM:	DATE CREATED:	REVISION DATE:
UTM NAD 1983 Z15N	26-MAR-10	24-MAY-12
0 2 4 Kilometres / 0 1 2 Miles	VERSION NO: 4.0	QA/QC: APPROVED

Legend

Habitat Suitability Index

- 0.00
- 0.01 - 0.25
- 0.25 - 0.50
- 0.50 - 0.75
- 0.75 - 1.00

- Potential Dewatered Area
- Keeyask Principal Structures

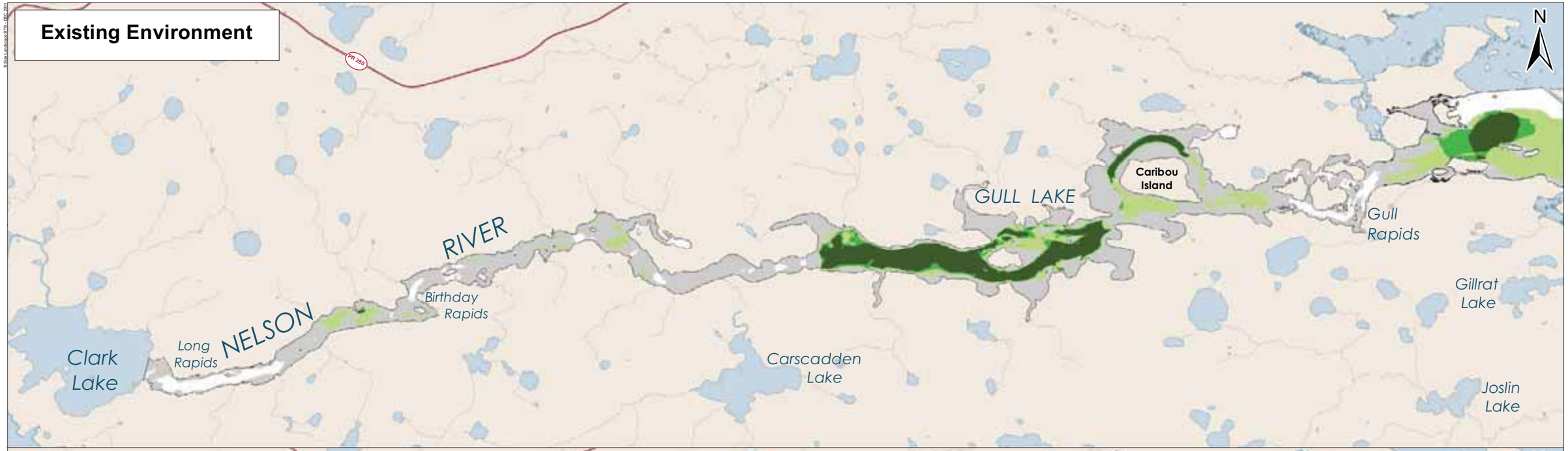
Note: Existing Environment frame shows 95th percentile inflow and Stephens Lake level of 141.1m. Post-Project frame shows Year 30 shoreline, reservoir at 159 metres and 95th percentile inflow with 7 unit full gate plant operation with spill and Stephens Lake level of 141.1m. Mitigation measures are not shown. Extents of dewatered area are estimated based on the existing environment 95th percentile flow.

Young-of-the-Year Lake Sturgeon Habitat

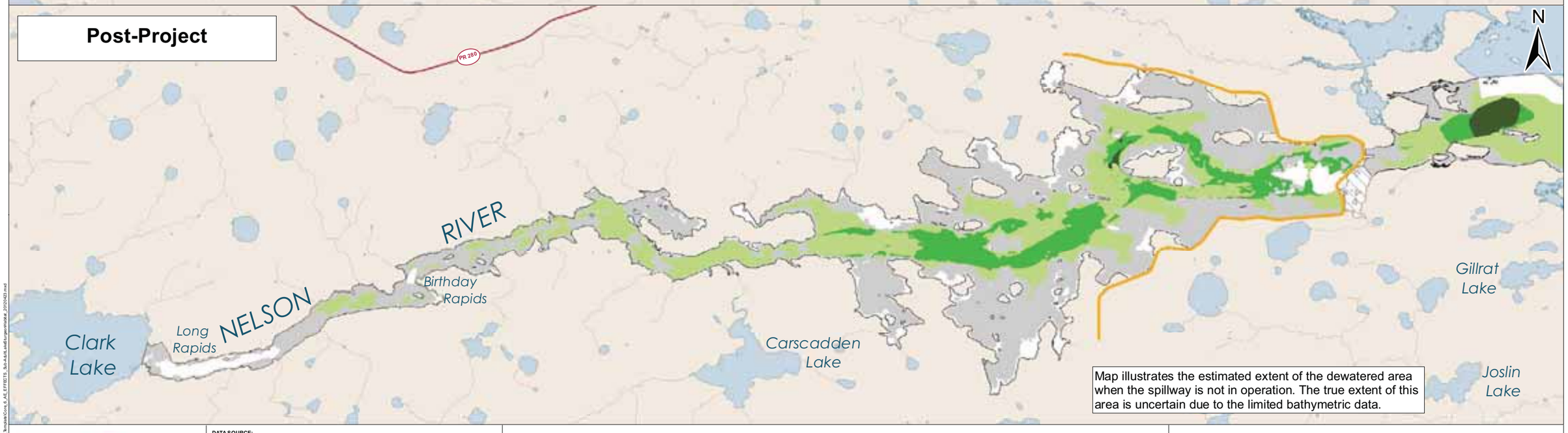
Habitat Suitability Index Model Output

Map 6-61

Existing Environment



Post-Project



Keeyask Hydropower Limited Partnership

DATA SOURCE:
Manitoba Hydro, North/South Consultants, Government of Canada
gull-ee-95perc-4327cms-rev3, pp-95perc-4327-159-shore-rev5

CREATED BY:
North/South Consultants

COORDINATE SYSTEM:	DATE CREATED:	REVISION DATE:
UTM NAD 1983 Z15N	26-MAR-10	24-MAY-12
0 2 4 Kilometres / 0 1 2 Miles	VERSION NO: 3.0	QA/QC: APPROVED

Legend

Habitat Suitability Index
- 0.00
- 0.01 - 0.25
- 0.25 - 0.50
- 0.50 - 0.75
- 0.75 - 1.00

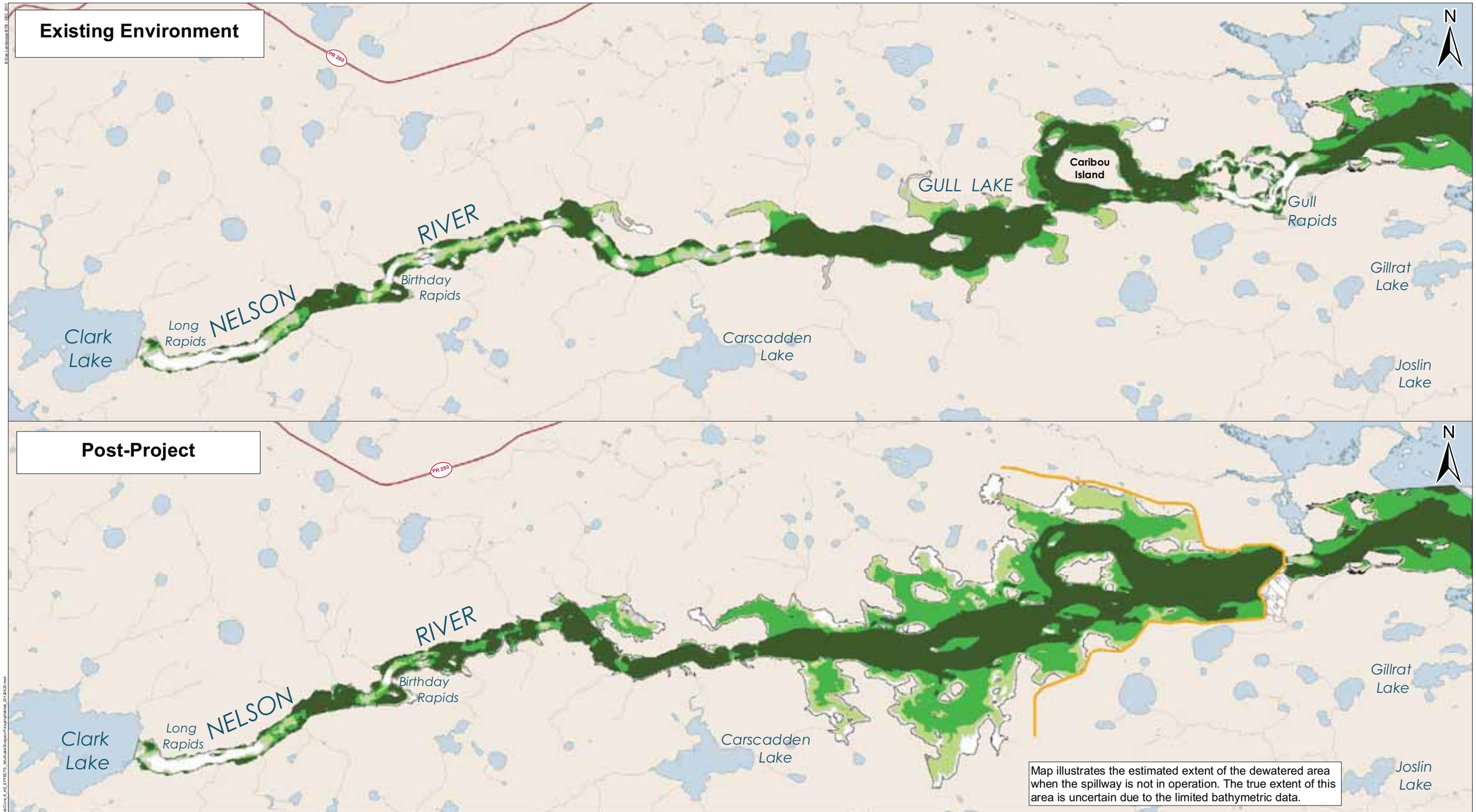
- Potential Dewatered Area
- Keeyask Principal Structures

Note: Existing Environment frame shows 95th percentile inflow and Stephens Lake level of 141.1m. Post-Project frame shows Year 30 shoreline, reservoir at 159 metres and 95th percentile inflow with 7 unit full gate plant operation with spill and Stephens Lake level of 141.1m. Mitigation measures are not shown. Extents of dewatered area are estimated based on the existing environment 95th percentile flow.

Sub-Adult Lake Sturgeon Habitat

Habitat Suitability Index Model Output

File Location: G:\EES\Keeyask\Publish_MXDs\CORE_VOLUME\In_Updated_Templates\Core_6_AE_EFFECTS_Sub-Adult_LakeSturgeonHabitat_20120423.mxd



KEEYASK Hydropower Limited Partnership

DATA SOURCE:
Manitoba Hydro, North/South Consultants, Government of Canada
gull-ee-95perc-4327cms-rev3, pp-95perc-4327-159-shore-rev5

CREATED BY:
North/South Consultants

COORDINATE SYSTEM:	DATE CREATED:	REVISION DATE:
UTM NAD 1983 Z15N	26-MAR-10	24-MAY-12
0 2 4 Kilometres / 0 1 2 Miles	VERSION NO: 3.0	QA/QC: APPROVED

Legend

Habitat Suitability Index

- 0.00
- 0.01 - 0.25
- 0.25 - 0.50
- 0.50 - 0.75
- 0.75 - 1.00

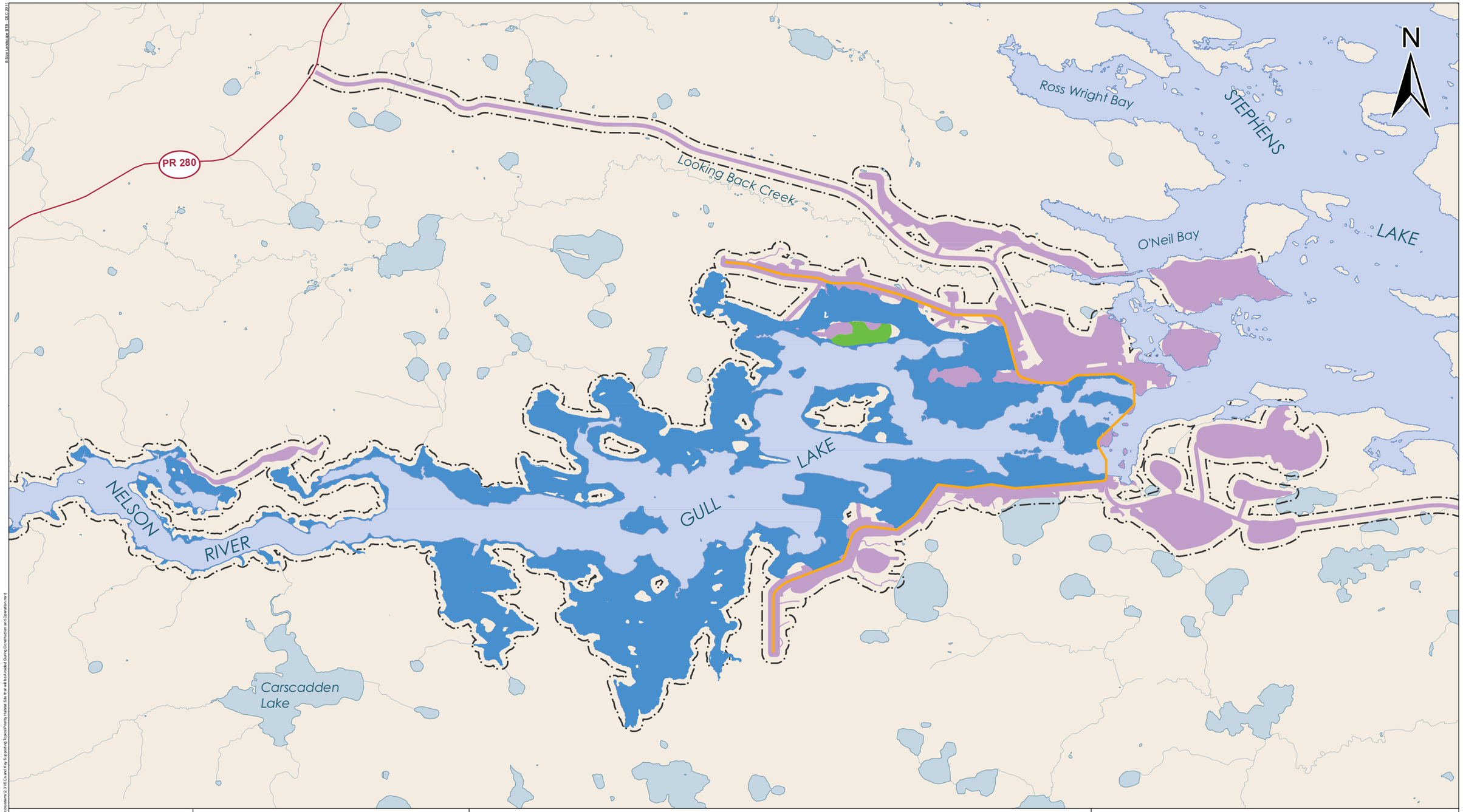
- Potential Dewatered Area
- Keeyask Principal Structures

Note: Existing Environment frame shows 95th percentile inflow and Stephens Lake level of 141.1m. Post-Project frame shows Year 30 shoreline, reservoir at 159 metres and 95th percentile inflow with 7 unit full gate plant operation with spill and Stephens Lake level of 141.1m. Mitigation measures are not shown. Extents of dewatered area are estimated based on the existing environment 95th percentile flow.

Adult Lake Sturgeon Foraging Habitat

Habitat Suitability Index Model Output

Map 6-63



KEEYASK
Hydropower Limited Partnership

DATA SOURCE:
Study areas, habitat site and Nelson River shoreline - ECOSTEM Ltd.; Year 30 reservoir - ECOSTEM Ltd. and J D Mollard and Associates; Water - NTS; Roads and rail - Manitoba Conservation.

CREATED BY:
ECOSTEM Ltd.

COORDINATE SYSTEM:	DATE CREATED:	REVISION DATE:
UTM NAD 1983 Z15N	30-MAY-12	30-MAY-12
0 0.9 1.8 Kilometres / 0 0.8 1.6 Miles	VERSION NO: 1.0	QA/QC: JWE/YYY/ZZZ

Legend

Priority Habitat Patches To Avoid
- Borrow Area N-6 Sensitive Site

Reservoir Area (159 m)
- Reservoir at Year 30

Study Areas
- Project Footprint During Construction and Operation
- Ecosystem Diversity Local Study Area
- Keeyask Principal Structures

Priority Habitat Site To Avoid
During Construction and Operation

Map 6-64