Shale Gas
Water Management
Responsible Development

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Nexen Inc.

Water Management Plan
Dilly Creek Lease • Horn River Basin • NE British Columbia
April, 2012
Shale Gas
An Introduction

Water Management Plan
Concept & Implementation

Responsible Development
An Established Principle

Water Management Plan
Dilly Creek Lease • Horn River Basin • NE British Columbia
April, 2012
WESTERN CANADIAN SEDIMENTARY BASIN

AN INTRODUCTION TO SHALE GAS DEVELOPMENT

Gas-Rich Shale Gas Basins
• Dense: derived from clay and mud
• Layers deposited over 500MM years
• Organic material trapped between layers
• In deep formations, heat and pressure breaks down the organics into oil and natural gas
• Some of the gas migrates out of the shale and congregates in discrete pools or above oil (conventional gas)
• The rest of the gas is adsorbed i.e. coats the surfaces of the shale or, it is trapped in sand between layers
• Until ten years ago, shale gas was largely ignored.
• Vertical drilling penetrated shale beds on the way to conventional oil and gas deposits.
• The exposed surface area was never great enough to produce gas in commercial volumes.
Hydraulic fracturing or ‘fracking’ was first used to recover natural gas and oil in 1947.

Conventional hydraulic fracturing, which typically consumes 75,000 to 300,000 litres of fluid per well, has been used over the years to stimulate high-permeability conventional reservoirs.
AN INTRODUCTION TO SHALE GAS DEVELOPMENT

HORIZONTAL DRILLING

- **1920’s** Wells were deviating from vertical and resulting in lawsuits

- **1930** Sun Oil contracted the Sperry Corporation to modify small gyroscopic compasses to guide directional drilling

- **1940’s & 1950’s** ‘Bottom Hole Assembly’ (BHA) drilling equipment was developed

- These gyro and BHA tools made directional drilling possible

- **1970** Downhole drilling motors propelled by ‘mud’ were developed

- Directional wells were first used to drill relief wells for ‘blowouts’
AN INTRODUCTION TO SHALE GAS DEVELOPMENT

SHALE HYDRAULIC FRACTURING

Horizontal Drilling

Cement & Casing

Perforation

Hydrofracking

Shale

Horizontal Well Bore

Casing

Pumped Cement

Shot

High Pressure Frac Fluid
In multi-stage fracking, a portion of the horizontal well bore is fracked and then, this section is isolated with a cement plug and another section is fracked continuing the process right back to the vertical well bore. Once fracking is complete, the cement plugs are drilled out to allow the gas to escape. This method of multi-stage fracking was first used in the late 1990s in the Barnett Shale Bed in Texas.
AN INTRODUCTION TO SHALE GAS DEVELOPMENT

SHALE GAS - RISE TO PROMINENCE

RISE TO PROMINENCE

• Commercially viable due to horizontal drilling and multi-stage fracking
• Outstanding success in the United States
• Wide-spread publicity
• Responsible for the U.S. 100-year supply of natural gas
• Major contribution to energy independence in the U.S.

IMPORTANCE

• In Canada, 40% of conventional gas has been produced
• Large reserves make it a viable replacement supply for the future
• Has the potential for a new industry, job creation and economic stimulus
• Represents a new source of revenue for Government
• Opens up the potential for new international markets and trade
An introduction to Shale Gas Development

Hydraulic fracturing - Water is a key issue

- Large quantities of water are required
- 3,000 - 5,000 m$^3$ of water are needed per ‘frac’
- Most wells require multiple ‘fracs’
- Most drilling operations involve multiple wells
- As gas economics improve, the number of wells will increase
- Competition with: agriculture, ranching, mining, municipalities
- Water depletion can affect wildlife habitat
- Concerns regarding water quality
AN INTRODUCTION TO SHALE GAS DEVELOPMENT

NEXEN’S SHALE GAS STRATEGY

- The NE B.C. Leases are considered long-term assets
- A resource for the future
- Establish a strong land position
- Develop these leases at a measured pace
- Gear the pace of development to: gas demand, gas price, new markets and return-on-investment
- Develop an efficient, cost-effective method of production
- Invest in new technologies
AN INTRODUCTION TO SHALE GAS DEVELOPMENT

HORN RIVER DEVELOPMENT TO DATE

• Development began in 2007
• Production began in 2009
• Currently working with a short-term water permit
• 24 wells drilled and completed
• 18 wells to be completed July 2012
• 10 wells scheduled to drill in 2012
• Etsho North Gas Plant upgrade completed in 2011
• Tsea Gas Plant scheduled to be on-stream by the end of 2012 (150MMCF/D raw)
AN INTRODUCTION TO SHALE GAS DEVELOPMENT

SEASONAL NATURE OF HORN RIVER ACTIVITY

- October: Late Fall / Winter Drilling Period (stable, frozen ground)
- November: Late Fall / Winter Drilling Period (stable, frozen ground)
- December: Late Fall / Winter Drilling Period (stable, frozen ground)
- January: Late Fall / Winter Drilling Period (stable, frozen ground)
- February: Late Fall / Winter Drilling Period (stable, frozen ground)
- March: Water Storage Period (thaw & rain)
- April: Water Storage Period (thaw & rain)
- May: Water Storage Period (thaw & rain)
- June: Water Storage Period (thaw & rain)
- July: Water Storage Period (thaw & rain)
- August: Fracking Period
- September: Fracking Period
Water Management Plan
Concept & Implementation
Responsible Development
Conforming to Policy
WATER MANAGEMENT PLAN
NEXEN’S WATER MANAGEMENT STRATEGY

- Obey the law
- Manage Responsibly
- Think Long-Term
- Consult with Stakeholders
- Create and Maintain a Water Management Plan
- Publish Performance Results
- Invest in New Technology
- Reduce Fresh Water Use
- Safe Disposal of Frac Fluid
HORN RIVER – ESTIMATED WATER NEED

- 1 pad /year
- 20 wells /pad
- 20 fracs /well
- 3,000-5,000 m$^3$ of water /frac
- 60,000-100,000 m$^3$ of water /well
- 1.2 million m$^3$ to 2.0 million m$^3$ of water/year
POSSIBLE SOURCES OF WATER

Surface Water

Recycled Frack Water

Municipal Waste Water

Trucked Water

Deep Aquifer Saline Water
SOURCES OF WATER CONSIDERED

- Surface Water
- Recovered Frack Water
- Deep Aquifer Saline Water
The aquifer runs under the Dilly Creek Lease

The top of the aquifer is 645 m below the surface

Total thickness: 83 meters

Estimated porosity over the current wells: 35%

Reservoir pressure: 4,550 kPa or ~6.4 kPa/meter

The ‘sweet spot’ is in a highly porous area - an advantage not found throughout the Basin

Need a solution to the H$_2$S problem before the option is feasible
DEBOLT WATER - THE PROBLEM

- Too salty to drink
- Salt water containing ~22,000 TDS (total dissolved solids)
- Sea water is ~35,000 TDS
- Heavy to pump
- Gas:Water Ratio: 1.35 m$^3$/m$^3$
- Gas content: 57% methane (C$_1$), 42% carbon dioxide (CO$_2$) and 0.5% hydrogen sulfide (H$_2$S)
- H$_2$S gas is lethal
- H$_2$S dissolved at reservoir pressure
- Atmospheric pressure is less than the gas ‘bubble point’ therefore, in air, Debolt water releases H$_2$S gas
OPTIONS

1. **TREAT TO FRAC SPEC**  i.e. remove the H$_2$S  
   Encana & Apache used this method at their Two Island Lake Plant  
   It is a very expensive approach (est. $87MM in Capital + OPEX)

2. **TREAT TO POTABLE SPEC**  i.e. remove the H$_2$S and dissolved solids.  
   To date, this is unproven technology with field trials underway  
   Frac water can be treated to a lower standard if used again for fracking  
   (est. cost of $3-$5/m$^3$ of water treated and it is also energy intensive)

3. **PRESSURIZED FRAC ON DEMAND (PFOD)**  A Closed Loop System  
   i.e. keep the Debolt water in its raw state, at formation pressure,  
   unexposed to the atmosphere and dispose of returned frac fluid to the  
   Debolt aquifer after use
DEBOLT WATER - THE CURRENT SOLUTION

Purpose-Built Water Treatment Plant
OPTION 3 PRESSURIZED FRAC ON DEMAND (PFOD)

Closed Loop
Debolt water kept at reservoir pressure and never exposed to air

Surface Water
→ Blender
→ Dirty Water Side

Clean Water Side

Ground

Frac Pumps

3 to 4 Source Wells

2 Disposal Wells

Debolt Zone

Shale Layer
DEBOLT WATER - PREFERRED SOLUTION

OPTION 3 PRESSURIZED FRAC ON DEMAND
NEXEN’S WATER SOURCE PLAN

FUTURE

Limited Surface Water

Deep Aquifer Saline Water
NEXEN’S WATER SOURCE PLAN

**FUTURE**

- Limited Surface Water
- Deep Aquifer Saline Water

**PRESENT**

- Surface Water
- Borrow Pit Storage
SELECTED WATER SOURCE - THE TSEA LAKES
WATER MANAGEMENT PLAN

SELECTED WATER SOURCE - THE TSEA LAKES

Drilling Pad

Tsea River

Water Pipeline

North Tsea

Mid Tsea

South Tsea

North Tsea Lake
PERMISSION TO USE WATER IN B.C.

Short-term Water Permits
Oil & Gas Commission
Regulatory Body

- Permits may be suspended during B.C. droughts
- Less security for planning purposes
- Permits issued annually
- Regulating multi-users is difficult

Water License
B.C. Ministry of Forests, Lands & Natural Resource Operations (FLNRO)
B.C. Water Stewardship Branch

- Proposal based on real-time monitoring of water availability
- Reduces the need to draw water in periods of naturally low flow
- Enhances long-term security of water supply
- Increases certainty of annual water allocation
NEXEN’S DECISION CONCERNING PERMISSION

Short-term

- Application submitted in 2009
- A unique, adaptive Water Management Plan to govern the license was submitted in 2011

Short-term Water Permit
(B.C. Oil & Gas Commission)
- Applied for annually since 2009
- Currently operate on this basis

Long-Term

- Application submitted in 2009
- A unique, adaptive Water Management Plan to govern the license was submitted in 2011

Water License
(B.C. Ministry of Forests, Lands & Natural Resource Operations (FLNRO))
WATER MANAGEMENT PLAN

2009

GETTING TO KNOW THE TSEA LAKES
- Establish a site-specific data base
- Collect data for baselines for on-going impact monitoring

2010

GETTING A HANDLE ON A CONCEPT
- Identify a characteristic hydrologic profile
- Develop a concept for The Water Management Plan

2011

STRUCTURING & SUBMITTING THE PLAN
- Develop the rationale for The Water Management Plan
- Structure, quantify and submit The Plan to FLNRO

2012

COMMITTING THE PLAN TO PRACTICE
- Commit all aspects of The Plan to practice in anticipation of a license
- Refine and enhance monitoring capabilities
Getting to Know the Tsea Lakes
2009 FIELD WORK - OBJECTIVES

- Establish a site-specific data base
- Document the as-found conditions to create a baseline for monitoring impacts
- Determine the size of the catchment area that feeds the Tsea lakes
- Refine the understanding of seasonal changes suggested by regional data
- Identify animal species that depend on the Tsea River
2009 FIELD WORK - IMPACT BASELINE DATA

WATER QUALITY

FISH HABITAT UPSTREAM

DOWNSTREAM COMMUNITIES

TRUMPETER SWANS

FISH HABITAT DOWNSTREAM

WOODLAND CARIBOU
2009 FIELD WORK - DATA COLLECTION

- Precipitation
- Stream water levels and discharge
- Lake water levels and bathymetry (depth/volume)
- Snow course

- An effort to confirm the amount of water in the system
- Establishing data collection points
- Collecting site data for comparison with regional data
Mean Daily Discharge ( m³/sec ) TSEA RIVER VS. REGIONAL DISCHARGE

Tsea River
- At Geet-la Rd. (Downstream)

Regional
- Adsett Creek at Km 386

Date Range: May 2009 to Oct 2009
THE ETSHO ESCARPMENT & PLATEAU

• Approximately 340 meter increase in elevation

• An expected, corresponding increase in precipitation

• The discharge from Tsea Lakes is expected to be greater than the regional data suggests
2010 FIELD WORK

Getting a Handle on a Concept
2010 FIELD WORK - OBJECTIVES

• Identify the natural cycle of discharge from the Tsea Lakes and the Tsea River i.e. the timing of the peaks and the lows

• Understand how precipitation effects flow levels

• Test the assumptions concerning amount of water available made in 2009 on the basis of regional data

• Examine all of the data with a view to defining a concept for The Water Management Plan
2010 FIELD WORK - DATA COLLECTION

- Precipitation
- Stream water levels and discharge
- Snow course
- Regional Stream Flow Stations

- Snow course sampling on and off the plateau
- Refined and expanded water level and water discharge sites
Current data from the regional stations operated by the federal and provincial governments was compared to the data collected.
Mean Daily Discharge (m³/sec)  

**TSEA RIVER VS. REGIONAL DISCHARGE**

**Tsea River**
- At Geet-la Rd.
- At W32
- At W7

**Regional**
- Adsett Creek at Km 386

Graph showing daily discharge measurements from May to October 2010.
2010 FIELD WORK - NORTH TSEA LAKE AT W7

- Precipitation
- Stream water levels and discharge
- Regional Stream Flow Stations

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Dilly Creek

Gote Creek

North Tsea River

North Tsea Lake Outlet W7

Tsea Lakes Catchment Area
2010 FIELD WORK - CHARACTERISTIC CURVE

Mean Daily Discharge (m$^3$/sec)  TSEA RIVER AT W7- NORTH TSEA LAKE OUTLET

Most Significant Discharge - May through October
Mean Daily Discharge ( $m^3/sec$ ) TSEA RIVER AT W7- NORTH TSEA LAKE OUTLET

- **Most Significant Discharge** - May through October
  - Excessive Discharge
  - Robust Discharge
  - Moderate Discharge
  - Low Discharge

**2010 FIELD WORK - CHARACTERISTIC CURVE**
### CONCEPT

<table>
<thead>
<tr>
<th>Flow Conditions (m³/sec)</th>
<th>Licensed Withdrawal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excessive Discharge Stage</td>
<td>XX% of Daily Discharge</td>
</tr>
<tr>
<td>Robust Discharge Stage</td>
<td>XX% of Daily Discharge</td>
</tr>
<tr>
<td>Moderate Discharge Stage</td>
<td>XX% of Daily Discharge</td>
</tr>
<tr>
<td>Low Discharge Stage</td>
<td>No Withdrawal</td>
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**Annual Withdrawal Limit**: X,XXX,XXX m³/year
Structuring & Submitting the Plan
2011 FIELD WORK - OBJECTIVES

- Closely monitor downstream effects
- Study the catchment data to confirm water availability
- Develop the Rationale for The Water Management Plan
- Structure and quantify The Plan and submit it to FLNRO in support of our Water License application
- Test and verify the parameters used
The purpose of The Water Management Plan and the thinking behind it
Preserve the natural integrity of the Tsea Lakes ecosystem
The lakes discharge water on a continual basis
The rate of downstream discharge, or river outflow (m$^3$/sec), is proportional to the amount of water present in the lakes at any given time.
The amount of water in the lakes depends upon seasonal precipitation and varies throughout the year.
Preserving the natural integrity of the lakes requires that the withdrawal of water also varies.
The rate of water withdrawal will be determined by the natural rate of stream discharge.
The draw of water will not be allowed to impact the lakes beyond the impacts caused by natural seasonal changes.
Most water will be taken when the lakes are cycling through flood conditions

A ‘Make Hay While the Sun Shines’ Approach
Withdrawals may occur on a daily basis.
Water withdrawn will be stored in borrow pits
All water used for fracking will be drawn from these borrow pits.
Mean Daily Discharge (m³/sec)

TSEA RIVER AT W7 - NORTH TSEA LAKE OUTLET

Most Significant Discharge - May through October

- Excessive Discharge
- Robust Discharge
- Moderate Discharge
- Low Discharge

May 2010 to Oct 2010
CONCEPT

WATER MANAGEMENT PLAN

SUPPLY

Flow Conditions (m³/sec)

- Excessive Discharge Stage
- Robust Discharge Stage
- Moderate Discharge Stage
- Low Discharge Stage

DRAW

Licensed Withdrawal

- XX% of Daily Discharge
- XX% of Daily Discharge
- XX% of Daily Discharge
- XX% of Daily Discharge

Annual Withdrawal Limit

X,XXX,XXX m³/year
### Water Management Plan

#### Structuring the Supply Side

<table>
<thead>
<tr>
<th>Flow Conditions (m³/sec)</th>
<th>Supply</th>
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<tr>
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**Annual Withdrawal Limit**

**Median Discharge Rate**
# Water Management Plan

## Structuring the Supply Side

**Supply**

<table>
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<th>Flow Conditions (m³/sec)</th>
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<tr>
<td>Excessive Discharge Stage</td>
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<tr>
<td>Above Median Flow</td>
<td>Up to XX% above the Median Rate</td>
</tr>
<tr>
<td>Below Median Flow</td>
<td>Down to XX% below the Median Rate</td>
</tr>
<tr>
<td>Critically Weak Stage</td>
<td></td>
</tr>
<tr>
<td>Annual Withdrawal Limit</td>
<td></td>
</tr>
</tbody>
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**Median Discharge Rate**
FLOW CONDITIONS

( m³/sec)

**SUPPLY**

Flow Conditions

- **High Flow**
  Greater than XX% above the Median Rate

- **Above Median Flow**
  Up to XX% above the Median Rate

- **Below Median Flow**
  Down to XX% below the Median Rate

- **Low Flow**
  Below XX% of the Mean Annual Flow

**MEDIAN DISCHARGE RATE**

**ANNUAL WITHDRAWAL LIMIT**
QUANTIFYING THE SUPPLY SIDE

SUPPLY

Flow Conditions (m³/sec)

- **High Flow**
  - Greater than XX% above the Median Rate

- **Flood Threshold**
  - 80% above the Median Rate
  - 1.652 m³/sec

- **Below Median Flow**
  - Down to XX% below the Median Rate

- **Low Flow**
  - Below XX% of the Mean Annual Flow
  - 0.351 m³/sec

- **Median Discharge Rate**
  - 0.918 m³/sec

- **Low Flow Threshold**
  - 30% below the Mean Annual Flow

Annual Withdrawal Limit
## QUANTIFYING THE SUPPLY SIDE

### SUPPLY

<table>
<thead>
<tr>
<th>Flow Conditions</th>
<th>Median Discharge Rate: 0.918 m³/sec</th>
<th>Flood Threshold: 1.652 m³/sec</th>
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<td>Below 30% of the Mean Annual Flow</td>
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### Annual Withdrawal Limit
## Quantifying the Draw Side

### Supply

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<td>XX% of Daily Discharge</td>
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<td>Below 30% of the Mean Annual Flow</td>
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### Draw

<table>
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<th>Annual Withdrawal Limit</th>
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<tbody>
<tr>
<td>X,XXX,XXX m³/year</td>
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## QUANTIFYING THE DRAW SIDE

### SUPPLY

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<td><strong>High Flow</strong>&lt;br&gt;Greater than 80% above the Median Rate</td>
<td>25% of Daily Discharge</td>
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<td>15% of Daily Discharge</td>
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<td>10% of Daily Discharge</td>
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<td><strong>Low Flow</strong>&lt;br&gt;Below 30% of the Mean Annual Flow</td>
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### Annual Withdrawal Limit

- **2,500,000 m³/year**
## Final Construct

### SUPPLY

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**Annual Withdrawal Limit**: 2,500,000 m³/year
Mean Daily Discharge (m³/sec)

2010 DISCHARGE - TSEA RIVER AT W7

Days when allowed draw = 25% of Mean Daily Discharge
Days when allowed draw = 15% of Mean Daily Discharge
Days when allowed draw = 10% of Mean Daily Discharge
No draw allowed

IN EFFECT

Mean Daily Discharge

Days when allowed draw: 25%, 15%, 10%, No draw allowed

FLOOD
ABOVE MEDIAN
BELOW MEDIAN
LOW FLOW

Mean Daily Discharge (m³/sec)

2010 DISCHARGE - TSEA RIVER AT W7

Days when allowed draw = 25% of Mean Daily Discharge
Days when allowed draw = 15% of Mean Daily Discharge
Days when allowed draw = 10% of Mean Daily Discharge
No draw allowed

May 14th Flood Conditions
Discharge: 2.18 m³/sec
Draw: 25% 0.55 m³/sec

July 10th Above Median Conditions
Discharge: 1.28 m³/sec
Draw: 15% 0.192 m³/sec

Sept. 28th Below Median Conditions
Discharge: 0.71 m³/sec
Draw: 10% 0.071 m³/sec

No Withdrawal
IN EFFECT

Total Discharge: 17,600,000 m³ (April to October 2010)
Total Allowable Withdrawal: 3,400,000 m³ (19% of Total Discharge)
Current Fracking Requirement: 1,200,000 m³ (7% of Total Discharge) (35% of Licensed Withdrawal)

Mean Daily Discharge (m³/sec)

2010 DISCHARGE - TSEA RIVER AT W7

Water Licensed
Water Remaining
Total Discharge: 17,600,000 m³ (April to October 2010)
Total Allowable Withdrawal: 3,400,000 m³ (19% of Total Discharge)
Current Fracking Requirement: 1,200,000 m³ (7% of Total Discharge) (35% of Licensed Withdrawal)
SEASONAL NATURE OF HORN RIVER ACTIVITY

October
November
December
January
February
March
April
May
June
July
August
September

Late Fall / Winter Drilling Period (stable, frozen ground)

Water Storage Period (thaw & rain)

Fracking Period
BORROW PIT DEVELOPMENT

- Material is excavated for roads and well-pad construction
- The excavated pits are used as water storage pits
- Water storage serves to separate water source from water demand for the frack program
At current rate of drilling, i.e. one 20-well pad per year, water storage capacity will equal the annual water requirement in 2015.
**WATER LICENSE - CONSTRUCT**

### SUPPLY

**Flow Conditions**

- **High Flow**
  - Greater than 80% above the Median Rate
  - Flood Threshold: 1.652 m$^3$/sec
- **Above Median Flow**
  - Up to 80% above the Median Rate
  - Median Discharge Rate: 0.918 m$^3$/sec
- **Below Median Flow**
  - Down to 30% below the Median Rate
  - Low Flow Threshold: 0.351 m$^3$/sec
- **Low Flow**
  - Below 30% of the Mean Annual Flow

### DRAW

**Licensed Withdrawal**

- **25% of Daily Discharge**
- **15% of Daily Discharge**
- **10% of Daily Discharge**
- **No Withdrawal**

**Annual Withdrawal Limit**

- 2,500,000 m$^3$/year
As part of our water license proposal, Nexen has committed to an extensive environmental monitoring and reporting program to track potential impact on:

- Hydrology
- Climate
- Shallow Groundwater
DOWNSTREAM EFFECTS

- Precipitation
- Stream water levels and discharge
- Lake water levels and bathymetry (depths/contours)
- Snow course
Mean Daily Discharge (m³/sec)  GEET-LA ROAD AFTER THE DRAW

- May 2010
- Jun 2010
- Jul 2010
- Aug 2010
- Sept 2010
- Oct 2010
IMPACT MONITORING

In 2009, samples were taken across the region at various times to provide pre-impact baselines for periodic monitoring of...

- Water Quality
- Fish
- Birds
- Mammals
- Communities
REPORTING

- Ministry of Environment

Nexen will provide the results of its monitoring program in an annual report and review

- Fort Nelson First Nations and other Downstream Communities

Nexen will confer with community groups whenever requested, involve them in the monitoring program and, at a minimum, conduct an annual meeting and review of results
Committing the Plan to Practice
2012 FIELD WORK - OBJECTIVES

• Complete the implementation of The Water Management Plan in anticipation of the Water License

• Add data to and understanding of the factors that effect the catchment and control water availability

• Monitor the downstream effects of The Water Management Plan

• Standardize the collection of data to achieve continuity with the provincial and federal monitoring programs
WATER COLLECTION - FACILITIES

- An automatic interface is being installed to measure lake discharge and adjust the water withdrawal pump rate in accordance with The Water Management Plan.
- This process is facilitated by the fact that both the discharge from the lake and the pump speed are measured in m$^3$/sec.
Shale Gas
An Introduction

Water Management Plan
Concept & Implementation

Responsible Development
An Established Principle
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Concept & Implementation

Responsible Development
An Established Principle
NEXEN & RESPONSIBLE DEVELOPMENT

Nexen has a long-standing record of good stewardship and responsible resource development. These principles have been incorporated in the Water Management Plan:

- The company has a strong commitment to health, safety and the environment and social responsibility.
- The primary rationale for The Water Management Plan is to preserve the integrity of the Tsea Lakes.
- The current ‘Debolt Solution’ is unacceptable.
- Nexen always looks for and invests in ‘a better way’.
- A measured approach to shale gas development... determined by economics...has been used as an opportunity to find a better Debolt water solution.
- Site excavations are planned as borrow pits.
- Borrow pits separate water demand from the source.
- Our water license approach mitigates unintended, potentially harmful effects of short-term licensing.
- Nexen is committed to impact monitoring, reporting to stakeholders and protecting the environment.
Shale Gas
Water Management Plan
Responsible Development

Zoe Robson
Nexen Inc.

Water Management Plan
Dilly Creek Lease • Horn River Basin • NE British Columbia
April, 2012