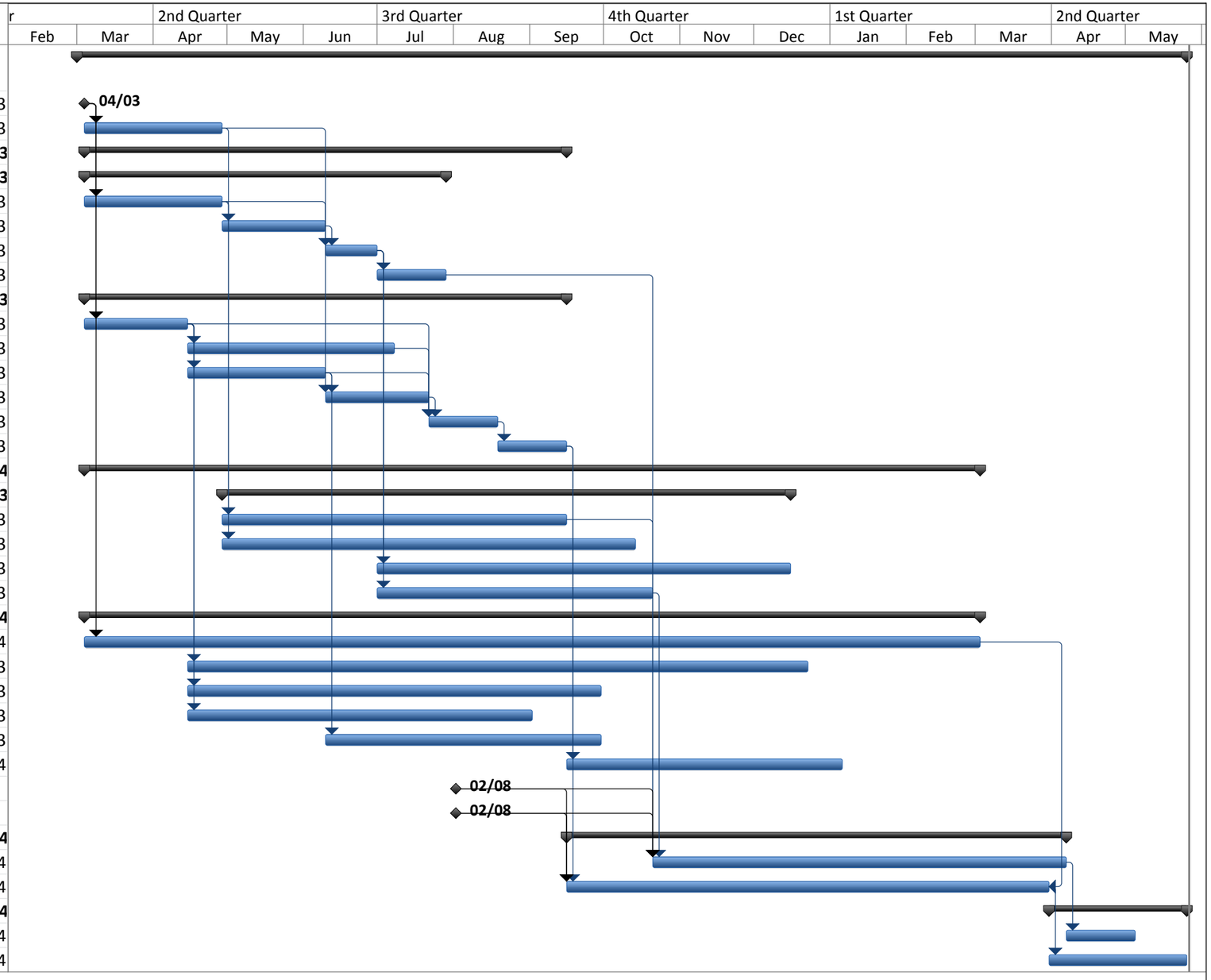
PROJECT PLANNING

Project Schedule

ID	Task Mode	Task Name	Start	Finish
1		**Northland Cochrane Solar 115kV Transmission System**	**Fri 01/03/13**	**Mon 26/05/14**
2		Notice to Proceed	Fri 01/03/13	Mon 04/03/13
3		Geotechnical Investigations	Mon 04/03/13	Mon 29/04/13
4		**Final Design**	**Mon 04/03/13**	**Mon 16/09/13**
5		**115kV Transmission Line**	**Mon 04/03/13**	**Mon 29/07/13**
6		Line Design & Procurement	Mon 04/03/13	Mon 29/04/13
7		Foundation Design	Mon 29/04/13	Mon 10/06/13
8		Review & Approval	Mon 10/06/13	Mon 01/07/13
9		Issue for Construction	Mon 01/07/13	Mon 29/07/13
10		**115kV Substations**	**Mon 04/03/13**	**Mon 16/09/13**
11		SLD & Equipment Spec.	Mon 04/03/13	Mon 15/04/13
12		P&C Design	Mon 15/04/13	Mon 08/07/13
13		Station & Structure Design	Mon 15/04/13	Mon 10/06/13
14		Foundation Design	Mon 10/06/13	Mon 22/07/13
15		Review & Approval	Mon 22/07/13	Mon 19/08/13
16		Issue for Construction	Mon 19/08/13	Mon 16/09/13
17		**Procurement**	**Mon 04/03/13**	**Mon 03/03/14**
18		**Transmission Line Procurement**	**Mon 29/04/13**	**Mon 16/12/13**
19		Pole Structures	Mon 29/04/13	Mon 16/09/13
20		Conductors & OPGW	Mon 29/04/13	Mon 14/10/13
21		U/G Cable	Mon 01/07/13	Mon 16/12/13
22		Insulators & Hardwares	Mon 01/07/13	Mon 21/10/13
23		**Stations Equipment Procurement**	**Mon 04/03/13**	**Mon 03/03/14**
24		27.6/115kV Transformer	Mon 04/03/13	Mon 03/03/14
25		115kV Breakers	Mon 15/04/13	Mon 23/12/13
26		115kV Disconnect Switches	Mon 15/04/13	Mon 30/09/13
27		115kV Equipments	Mon 15/04/13	Mon 02/09/13
28		Steel Structures	Mon 10/06/13	Mon 30/09/13
29		Insulators & Hardwares	Mon 16/09/13	Mon 06/01/14
30		REA Approval	Thu 01/08/13	Fri 02/08/13
31		LTC Approval	Thu 01/08/13	Fri 02/08/13
32		**Construction**	**Mon 16/09/13**	**Mon 07/04/14**
33		Transmission Line	Mon 21/10/13	Mon 07/04/14
34		Stations	Mon 16/09/13	Mon 31/03/14
35		**Commissioning**	**Mon 31/03/14**	**Mon 26/05/14**
36		Transmission Line	Mon 07/04/14	Mon 05/05/14
37		Stations	Mon 31/03/14	Mon 26/05/14



Project: 1250 Schedule for LTC (20
Date: Wed 16/01/13

Task	Project Summary	Inactive Milestone	Manual Summary Rollup	Deadline
Split	External Tasks	Inactive Summary	Manual Summary	Progress
Milestone	External Milestone	Manual Task	Start-only	
Summary	Inactive Task	Duration-only	Finish-only	

Critical Constraints

The Ministry of Environment ("**MOE**") Renewable Energy Approvals ("**REA**") for the Generation Projects and Transmission Facilities were filed at the end of October, 2012 and beginning of November, 2012. As such, based on the MOE's three month service guarantee, the Applicant anticipates receiving MOE approval of each REA by the end of June, 2013.

In addition to obtaining REA approvals, six crossing agreements must be entered into with various agencies and parties. These are noted in the "Land Matters", Exhibit F, Tab 1, Schedule 1 of this Application. The six agreements and current status are as follows:

(a) Ontario Northland Railway: engineering approval received on December 12, 2012 and waiting on legal agreement (see Exhibit F, Tab 1, Schedule, 2);

(b) Frederick House River (MNR): the MNR has been provided with the preliminary drawings of the proposed crossing for review and the Applicants have been advised that a Work Permit will be considered and applications will be processed by the MNR upon the MOE approving the REA;

(c) Algonquin Power 115 kV Transmission Line: Algonquin Power was provided with drafts of the proposed overhead crossing on November 29, 2012 and no response has yet been provided;

(d) H2O Power LP 115 kV Transmission Line: H2O Power LP was provided with drafts of the proposed underground cable crossing on November 29, 2012, and a response was provided on the same day indicating that the crossings are acceptable to H2O Power;

(e) MTO Highway 668 (Encroachment Permit EC-2012-53C-20: approved, on December 16, 2012 (see Exhibit, Tab, Schedule); and

(f) HONI Transmission Line: HONI is aware that the Applicants must cross its existing easement, given the proposed routing of the transmission line and the Calder SS. HONI was contacted on December 19, 2012 and was provided with the proposed underground cable crossing plans. The underground cable crosses HONI's overhead circuits C2H and C3H and easement Instrument No. C11912. registered on October 19, 1931 in favour of The Hydro-Electric Power Commission of Ontario. HONI advised the Applicants that it will produce a list of requirements for the crossing, as is standard for any crossing agreement. In addition, HONI advised the Applicants that it would not be completing the work necessary for the crossing and the Applicants will therefore undertake to complete this work. A draft copy of the proposed crossing agreement is provided in Exhibit F, Tab 1, Schedule 2 of this Application.

Additionally, a Road User's Agreement is to be entered into between the Applicants and the Town of Cochrane, and a Work Permit must be obtained from MNR

A draft of the proposed form of the Road User's Agreement (Exhibit F, Tab 1, Schedule 2) was sent to the Town of Cochrane on August 16, 2012 for review and comment. The Town's Solicitor provided comments on January 17, 2013. The Parties are working together to finalize this agreement.

The MNR has been provided with the preliminary drawings of the proposed works (transmission line in the road RoW and unopened road RoW) for review. The Applicants have been advised that a Work Permit will be considered and an application will be processed upon the MOE approving the REA.

Prolonged Adverse Weather Conditions

The Engineering, Procurement, and Construction ("EPC") contracts that will be executed by the Applicant for the construction of the Generation Sites and Transmission Facilities contemplate up to a 10 to 12 month construction window, with adequate provisions for weather delays. Extensive or prolonged adverse weather delays are considered and allowances are made and accounted for in the construction contracts. Extraordinary weather or conditions causing delays, such as (for example) hurricanes, tornadoes, floods and forest fires, would likely qualify as events of force majeure.

Furthermore, it is possible, and in some cases preferred to so some of the construction work over the winter months, for example site preparation and clearing of trees because the ground is firm or frozen and there are fewer environmental constraints (for example, no nesting or migrating birds).

Availability of Qualified Contractors and/or Skilled Trades Persons

The Applicants will contract with an established general contractor for the construction of the Generation Projects, and Transmission Facilities. As previously stated, the Generation Projects will cost on the order of $200 million, and will be the largest undertaking, compared to the estimated $10 million cost for the Transmission Facilities.

The general contractor that the Applicants select to construct the Generation Projects will be responsible to contract with qualified subcontractors to construct the Transmission Facilities.

The estimated capital cost of approximately $10 million for construction of the Transmission Facilities is a relatively small undertaking, compared to other projects, and resources and contractors are not expected to be limited.

Construction Windows Due to Environmental Constraints

It is preferable to construct the Transmission Facilities during the late spring, summer, and early fall months, and this construction period typically ranges between May and November. However, it is possible, and in some cases advantageous, to perform certain construction

activities outside of this 6 or 7 month construction window. For example, it may be preferable to do some line clearing and grubbing in the late fall or over the window for two reasons:

(a) to avoid any issues with migrating or nesting birds; and

(b) to clear vegetation and trees when the ground is frozen.

In addition, it is possible to perform some construction throughout the winter months, albeit at reduced productivity, depending on weather conditions and temperatures.

The Projected and Contractual In-Service Date for the Facilities

The contractual OPA Milestone Commercial Operation Dates ("MCOD's") for the Generation Facilities are as follows:

- Abitibi and Martin's Meadows - September 5, 2014.
- Empire and Long Lake - September 6, 2014.

It will be necessary for the construction of the Transmission Facilities to be complete by September 2014 in order for the Applicants to meet their required MCOD's of the respective Generation Projects.

PROJECT DETAILS

The Transmission Facilities associated with the Generation Projects will consist of the following:

- 115 kV switching station (Calder SS), located at the point of connection of the four Generation Projects to the HONI 115 kV transmission system;
- Approximately 350 metres of 115 kV underground cable (part of Segment A) from the Calder SS to the Transition Station
- 115 kV underground cable connecting Calder SS to the Transition Station
- 27.6-115 kV step-up transformer substation (Main TS) of the 3 eastern Generation Projects (Martin's Meadows, Abitibi and Empire)
- Approximately 21 kilometres of 115 kV overhead transmission line (part of Segment A) connecting the Transition Station to the Main TS
- 27.6-115 kV step-up transformer substation (Calder TS) of the Long Lake solar Project
- Approximately 500 metres of 115 kV overhead transmission line (Segment B) connecting Calder TS to Calder SS

A detailed description of the Transmission Facilities is provided in Exhibit B, Tab 1, Schedule 1, paragraphs 8-18. Single-line diagrams of the proposed Transmission Facilities are attached as Exhibit B, Tab 2, Schedule 5.

All overhead transmission lines will be single-circuit, single pole design. The proposed pole height will vary between sixty-five (65) and eighty-five (85) feet. Taller poles may be required for crossing over railways, water bodies and other transmission/distribution lines. Overhead transmission line preliminary plan and profile drawings and stringing charts are provided in Exhibit D, Tab 1, Schedule 3.

Typical span between consecutive poles will be approximately one-hundred (100) meters. Transmission line poles on straight runs will be single wood/composite poles, primarily self-supporting, buried in soil or rock foundations (as required by the geotechnical studies), whereas corner/turning structures, where required, will be guyed wooden/composite poles or steel monopoles. Overhead transmission line pole structure summaries and typical pole details are provided in Exhibit D, Tab 1, Schedule 3. Overhead lines will be equipped with a single, Optical Ground Wire (OPGW) for transmission line lightning protection and housing of optical links for protections, communications and SCADA.

Overhead transmission line design criteria and clearances will conform to Canadian Standards Association (CSA) requirements.

The conductor preliminarily selected for all overhead transmission line circuits is 336 ACSR - Linnet. Taking into account that according to the requirements of the Electrical Code, 25% of the transmission line ampacity must be reserved for overloads, the resulting maximum capacity

of the conductor for continuous operation will be 90 MVA. Thus the size of the overhead transmission line conductor is in excess of what is required for safe operation of the transmission facilities. The conductor has been oversized in an effort to reduce electrical losses.

The underground cable between the Transition Station and Calder SS will consist of three (3) single-phase conductors, each equipped with a concentric neutral and an interstitial fiber/optic cable for SCADA, communications and protections. A separate fiber optic cable may also be provided. The underground power cables will be laid in flat or trefoil formation in the trench and will be encased in sand. Cables will be mechanically protected as required by electrical codes and in accordance with specifications produced by the Engineer. Road crossing mechanical protection and cable installation requirements will additionally comply with MTO requirements. The cables will be installed approximately 6 feet below grade. A ground continuity conductor will also be provided for the underground cable installation. The underground power cable manufacturer and size has not yet been selected. However, it is anticipated that the cables will be sized to carry a minimum of 90 MVA on a continuous basis, so as to match the ampacity of the overhead circuits.

Underground cable installation typical burial and duct bank cross-section details are provided in Exhibit D, Tab 1, Schedule 3.

Preliminary layouts of Calder SS, Calder TS and Main TS, including major equipment are provided in Exhibit B, Tab 2, Schedule 5.

The insulation systems of all Transmission Facilities will at minimum be rated to operate continuously at voltages of up to and including 132 kV, as per requirements detailed in the IESO SIA.

Surge arresters will be installed on all phases at overhead line termination points in substations, transformer terminals and transitions between overhead line and high voltage insulated cables. All surge arrester ratings will be reviewed by HONI. Direct lightning strike shielding will be provided for all substations and will comply with IEEE and industry-accepted guidelines.

High voltage (115 kV) automatic isolation devices (breakers) will be located at the Calder SS, Calder TS and Main TS. These devices will be equipped with "A" and "B" breaker failure protections, programmed into line protection relays. An independent, 115 kV motorized disconnect switch, complete with a grounding switch and interlock will be installed on the line side of each high voltage interrupter. The 115 kV motorized disconnect switch will serve as the visual isolation device, at the point interconnection to the HONI transmission system and will comply with the provisions of the OEB's Transmission System Code ("TSC"). In the preliminary specification, all high voltage breakers will be rated for a fault interrupting capability of not less than 50 kA rms. High voltage breaker typical opening time will be three (3) cycles. Such ratings exceed the requirements of the TSC.

The Transmission Facility grounding will consist of grounding systems at the Calder SS, Calder TS, Main TS, new 115 kV transmission line towers, Transition Station, medium voltage collector systems of the Generation Projects, all of which will be interconnected as a single composite grounding system. All grounding systems will be sized at minimum to carry the maximum available ground fault current for the longest expected duration, governed by the breaker fail clearing duration and industry-accepted safety margins. All safety grounding systems will be designed to comply with the requirements of the Ontario Electrical Safety Code as well as ANSI/IEEE standards.

"A" and "B" protection systems will be provided for all high voltage transmission lines, high voltage busses, HONI tele-protections and main step-up transformer differential protections. High voltage relays in distinct protection groups will use separate current transformers and voltage transformer windings. Protection relays in distinct protection groups will be sourced from different manufacturers.

The 115 kV HONI tele-protections will comply with all HONI specifications and technical requirements. HONI has indicated "A" and "B" 115 kV tele-protections will utilize duplicate, monitored Bell S4T4 circuits or direct fiber optic links from Calder SS the HONI Hunta Switching Station. The connection has been classified by HONI as being non-NPCC impactive and as such telecommunications circuit path diversity is not required for protections. The generation rejection scheme will, however, require geographic path diversity, as per NPCC and NERC requirements. It is anticipated that communications required for generation rejection will utilize microwave and/or Bell S4T4 circuits.

Protection systems at the Calder SS, Calder TS and Main Transformer Substation will be supplied from two (2) local 125 VDC battery banks at each location. Each direct current system will be capable of carrying all local 125 VDC loads for a minimum duration of eight (8) hours. A manual transfer scheme will be provided at each location to allow the transfer of all local DC loads to either "A" or "B" local bank in the event of single battery bank maintenance. All critical 125 VDC supplies will be continuously monitored and failures will alarm in the Supervisory Control and Data Acquisition ("SCADA") system.

Equipment will be provided, for the transmittal of all required telemetry/SCADA quantities to HONI and the IESO. Real-time Power Quality Monitoring ("PQM") will be implemented at the point of HONI interconnection. All Transmission Facility intelligent electronic devices, including digital protective relays and remote terminal units will be equipped with Sequence of Event Recorders ("SER"). Digital protective relays will provide all necessary Digital Fault Recording ("DFR").

The functionality of all Transmission Facility protection systems will be verified at the time of commissioning, six (6) months following the in-service date, and on a four (4) year maintenance cycle. Signal adequacy tests of the 115 kV HONI tele-protection communication channels will be conducted on a twelve (12) month maintenance interval, with channel performance testing taking place every twenty four (24) months.

Minor inspections of major transformers will be completed on an annual basis and will include activities such as a visual inspection, cleaning of bushings, test operate of fans and tap changer on all taps as well as oil dissolved gas analysis test of the main tank and tap changer oil compartment.

Major transformer maintenance will be completed on a six (6) year cycle and will include, in addition to all annual maintenance items, power factor test of bushings and windings, testing of all transformer accessories, insulation resistance, tap ratio test as well as a verification of all annunciation points.

All high voltage isolation devices (breakers and disconnect switches) will be inspected on an annual basis including visual inspection of all bushing, bases, structures, ground mats and accessories as well as functionality test of all mechanical box and breaker tank heaters. Major breaker and disconnect switch maintenance will be completed on a six (6) year cycle and will include all annual maintenance items as well as timing tests, contact resistance measurements and bushing power factor tests of breakers. Major disconnect switch maintenance items will include lubrication, as well as contact resistance verification.

Overhead transmission line vegetation control will follow HONI and industry practices and will comply with all IESO as well as NERC/NPCC requirements.

Infra-red scanning of all high voltage electrical connections, major electrical equipment as well as overhead lines and buswork will be completed on an annual basis.

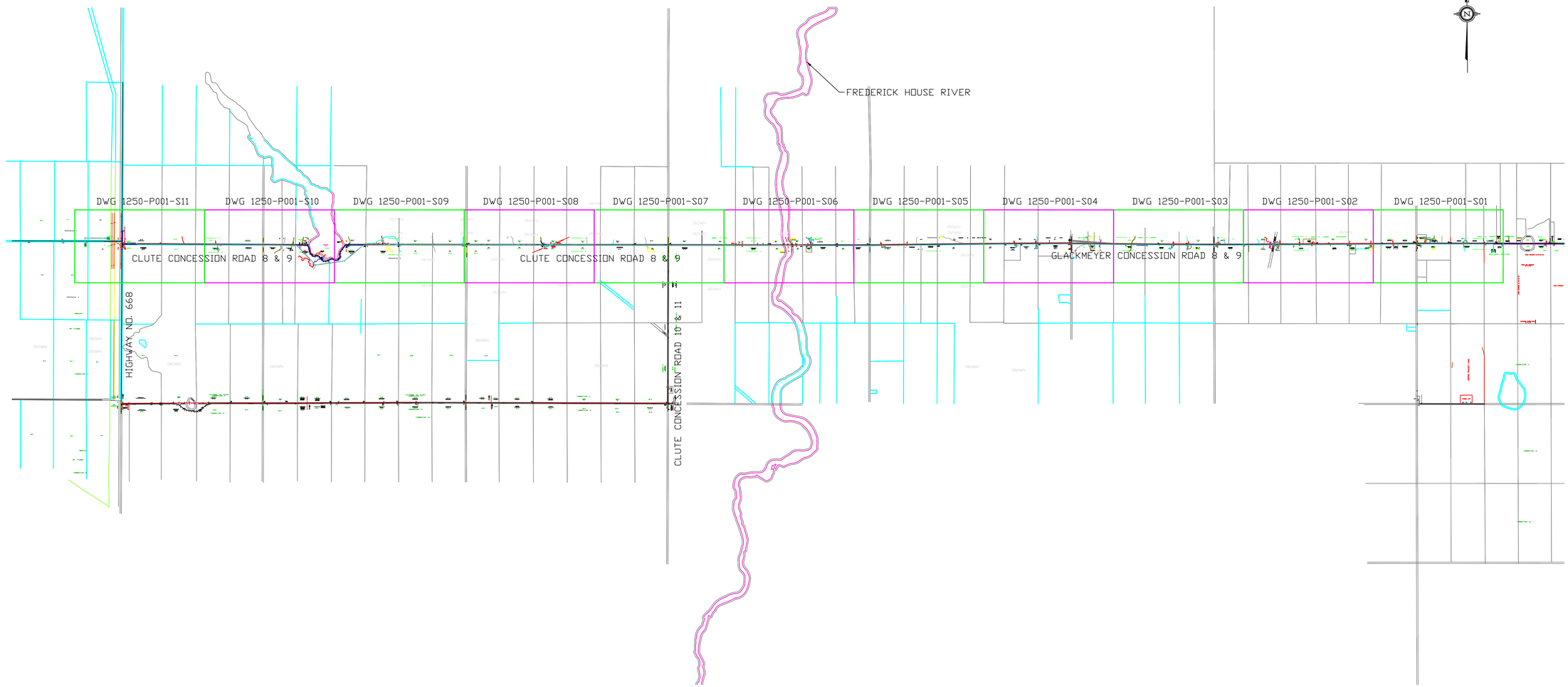
Plant controls will be programmed to ensure that islanded operation of the Generation Projects and automatic re-closing of high voltage breakers, following clearing of electrical faults within Transmission Facilities and out in the HONI transmission system, is inhibited. Plant control systems, including supervision from digital protective relays in the breaker close control circuits, will ensure that live line-dead bus conditions are present prior to and during solar plant control-assisted closing of all high voltage switching devices.

Project preliminary design and design description were submitted to IESO and HONI for review and connection approval. The review included a verification of the preliminary design of the Transmission Facilities to ensure that the requirements of the TSC have been fully satisfied and sufficient transmission system capacity is available to allow connection of the Generation Projects. The connection of the Generation Projects to the HONI transmission system, as designed, was approved and the single line diagram was posted on the IESO/HONI websites.

PROJECT DETAILS

Plan Drawings

NOTES:
1. FOR OVERALL SITE PLAN SHEET 1 TO SHEET 11, SEE DRAWING # 1250-P001-S01 TO S11.



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ISS	DDMMYY	APP	ISSUED FOR
A	05/12/12		ISSUED FOR REVIEW

REF	NUMBER	TITLE

REFERENCES

STAMP/SEAL

CLIENT PROJECT MGR. DEPARTMENT MGR. PROJECT MGR.

PROJECT PHASE

PROJECT NO. | ACTIVITY NO.

SCALE: N.T.S. | PACKAGE CODE

	BY	DDMMYY
DSN	E.KWONG	05/12/12
DRN	M.HUANG	05/12/12
CHK		
APP		

AREA: NORTHLAND POWER INC. COCHRANE SOLAR PROJECTS

SUBJECT: 115kV TRANSMISSION LINE OVERALL SITE PLAN

NORTHLAND POWER

Chimax Inc.
Engineering Company
3950 Fourteenth Ave. East, Suite 506
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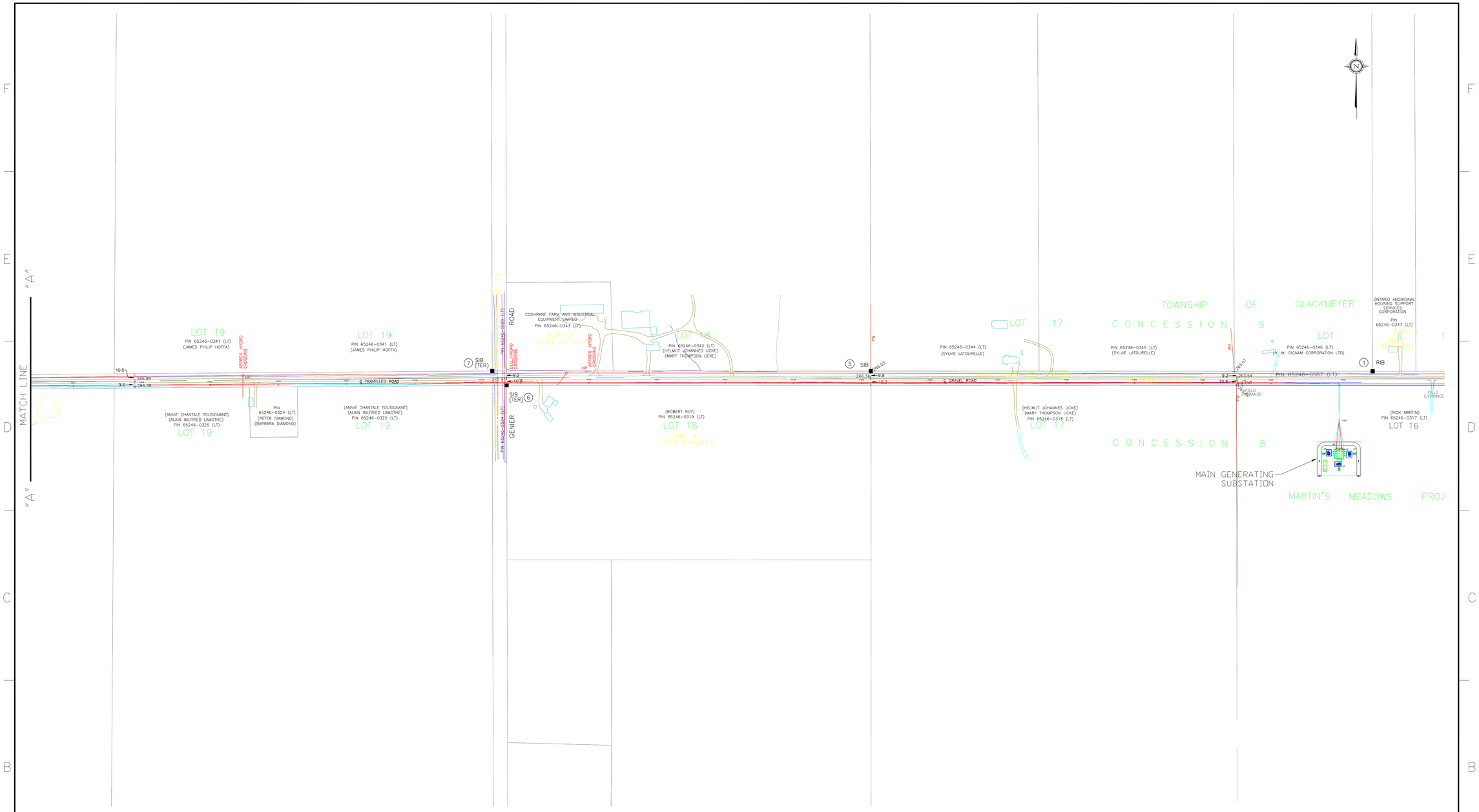
Email: chimax@chimax.ca

CLIENT DWG. NO.

DRAWING NO. 1250-P001 | REV. A

CAD FILE: 1250-P001-A



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DSN	E.KWONG	19/11/12
DRN	M.HUANG	19/11/12
CHK		
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AREA: NORTHLAND POWER INC. COCHRANE SOLAR PROJECTS

SUBJECT: 115kV TRANSMISSION LINE OVERALL SITE PLAN SHEET 1

NORTHLAND POWER

Chimax Inc.
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CLIENT DWG. NO.

DRAWING NO. 1250-P001-S01 | REV. A

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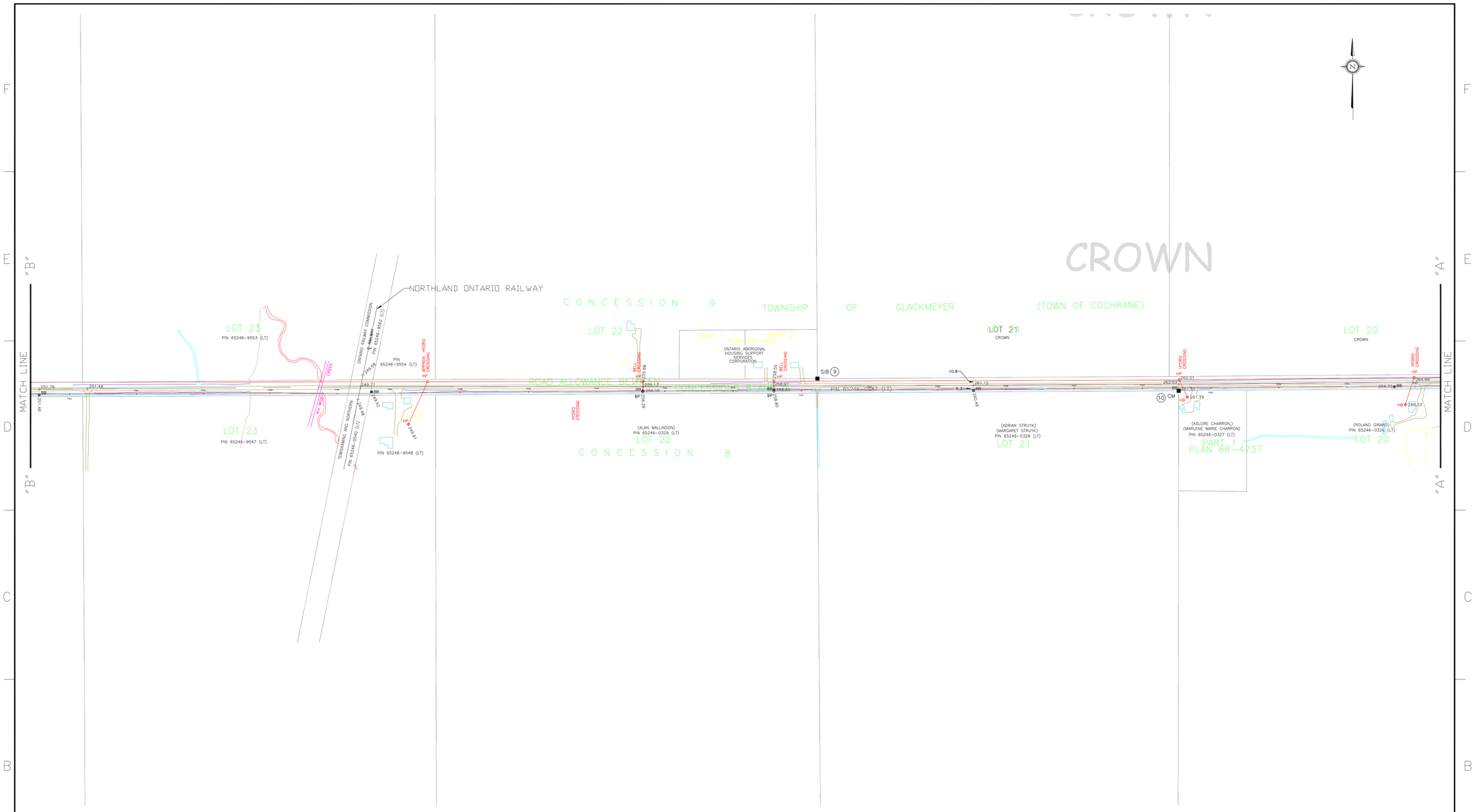

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PROJECT PHASE

AREA: NORTHLAND POWER INC. COCHRANE SOLAR PROJECTS

PROJECT NO.

ACTIVITY NO.

SCALE: N.T.S.

PACKAGE CODE

	BY	DDMMYY
DSN	E.KWONG	19/11/12
DRN	M.HUANG	19/11/12
CHK		
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SUBJECT: 115kV TRANSMISSION LINE OVERALL SITE PLAN SHEET 2

NORTHLAND POWER

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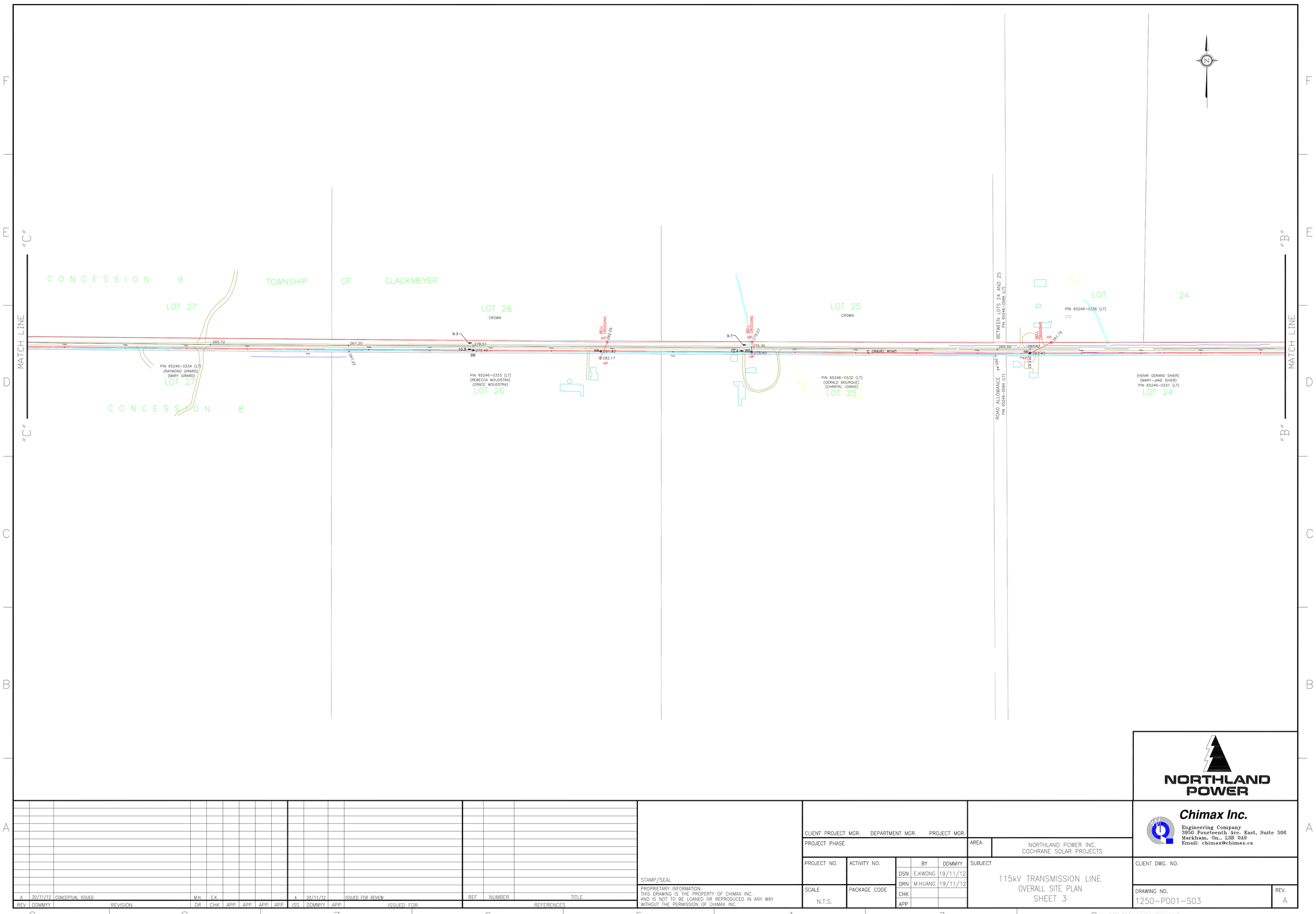
CLIENT DWG. NO.

DRAWING NO.: 1250-P001-S02

REV.: A

CAD FILE: 1250-P001-A



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PROJECT NO.

ACTIVITY NO.

SCALE: N.T.S.

PACKAGE CODE

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DSN	E.KWONG	19/11/12
DRN	M.HUANG	19/11/12
CHK		
APP		

AREA: NORTHLAND POWER INC.
COCHRANE SOLAR PROJECTS

SUBJECT
115kV TRANSMISSION LINE
OVERALL SITE PLAN
SHEET 3

NORTHLAND POWER

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CLIENT DWG. NO.

DRAWING NO. 1250-P001-S03

REV. A

CAD FILE: 1250-P001-A

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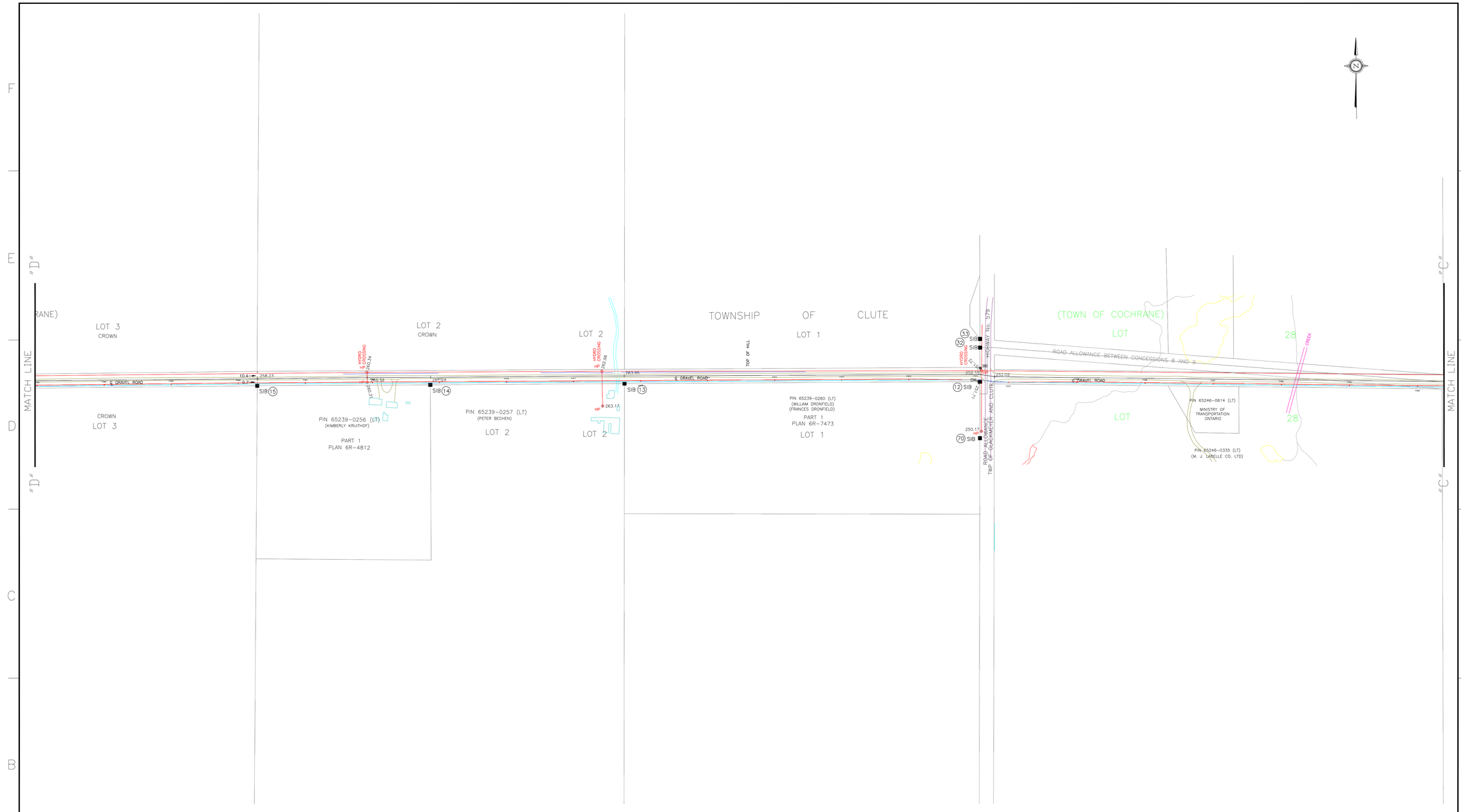

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ISS	DDMMYY	ISSUED FOR
A	20/11/12	ISSUED FOR REVIEW

REF	NUMBER	REFERENCES

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PROJECT PHASE

AREA: NORTHLAND POWER INC. COCHRANE SOLAR PROJECTS

PROJECT NO.

ACTIVITY NO.

SCALE: N.T.S.

PACKAGE CODE

	BY	DDMMYY
DSN	E.KWONG	19/11/12
DRN	M.HUANG	19/11/12
CHK		
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SUBJECT: 115kV TRANSMISSION LINE OVERALL SITE PLAN SHEET 4

NORTHLAND POWER

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CLIENT DWG. NO.

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REV.: A

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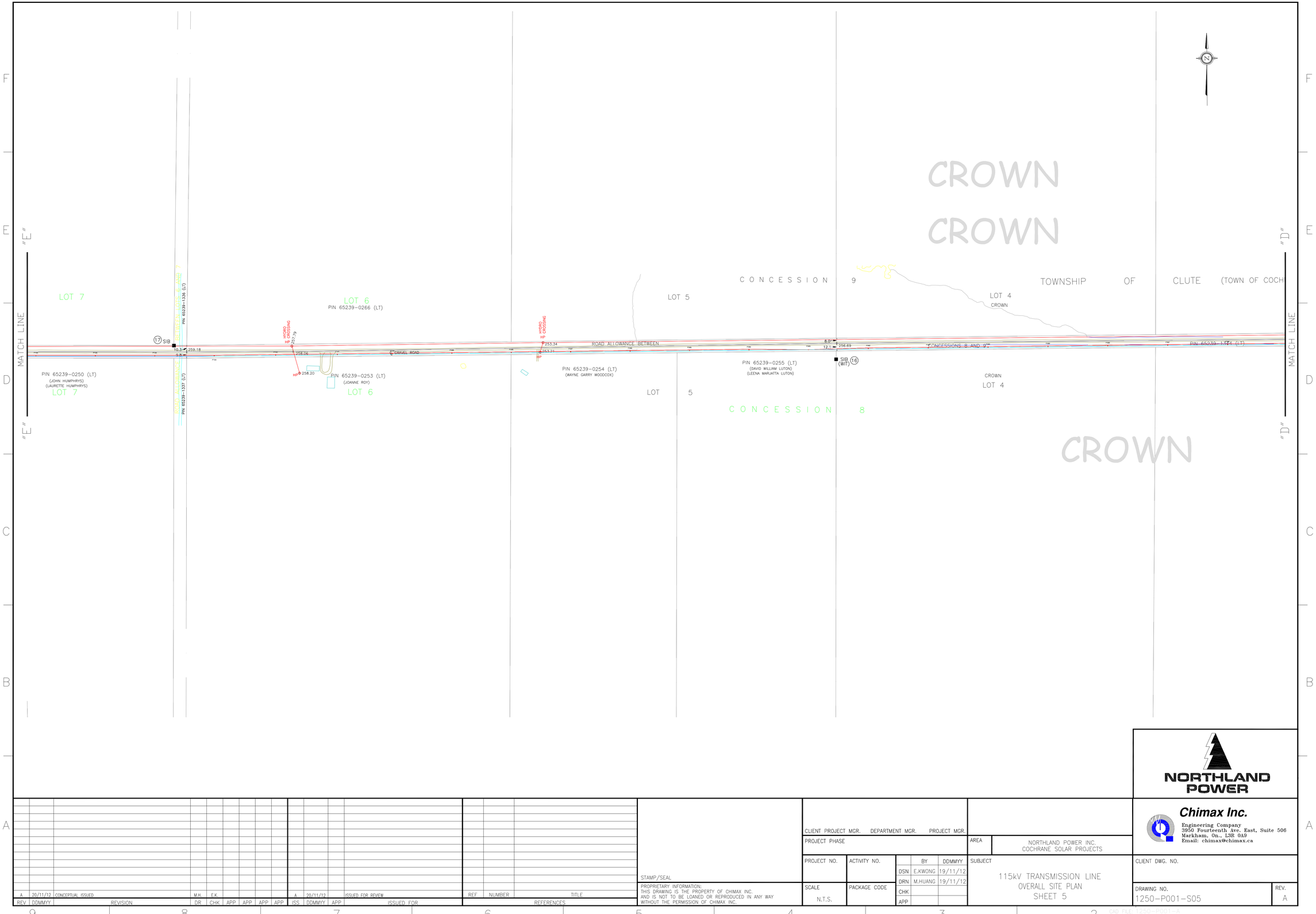

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PROJECT PHASE

PROJECT NO.	ACTIVITY NO.

SCALE	PACKAGE CODE
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	BY	DDMMYY
DSN	E.KWONG	19/11/12
DRN	M.HUANG	19/11/12
CHK		
APP		

AREA: NORTHLAND POWER INC.
COCHRANE SOLAR PROJECTS

SUBJECT: 115kV TRANSMISSION LINE
OVERALL SITE PLAN
SHEET 5

NORTHLAND POWER

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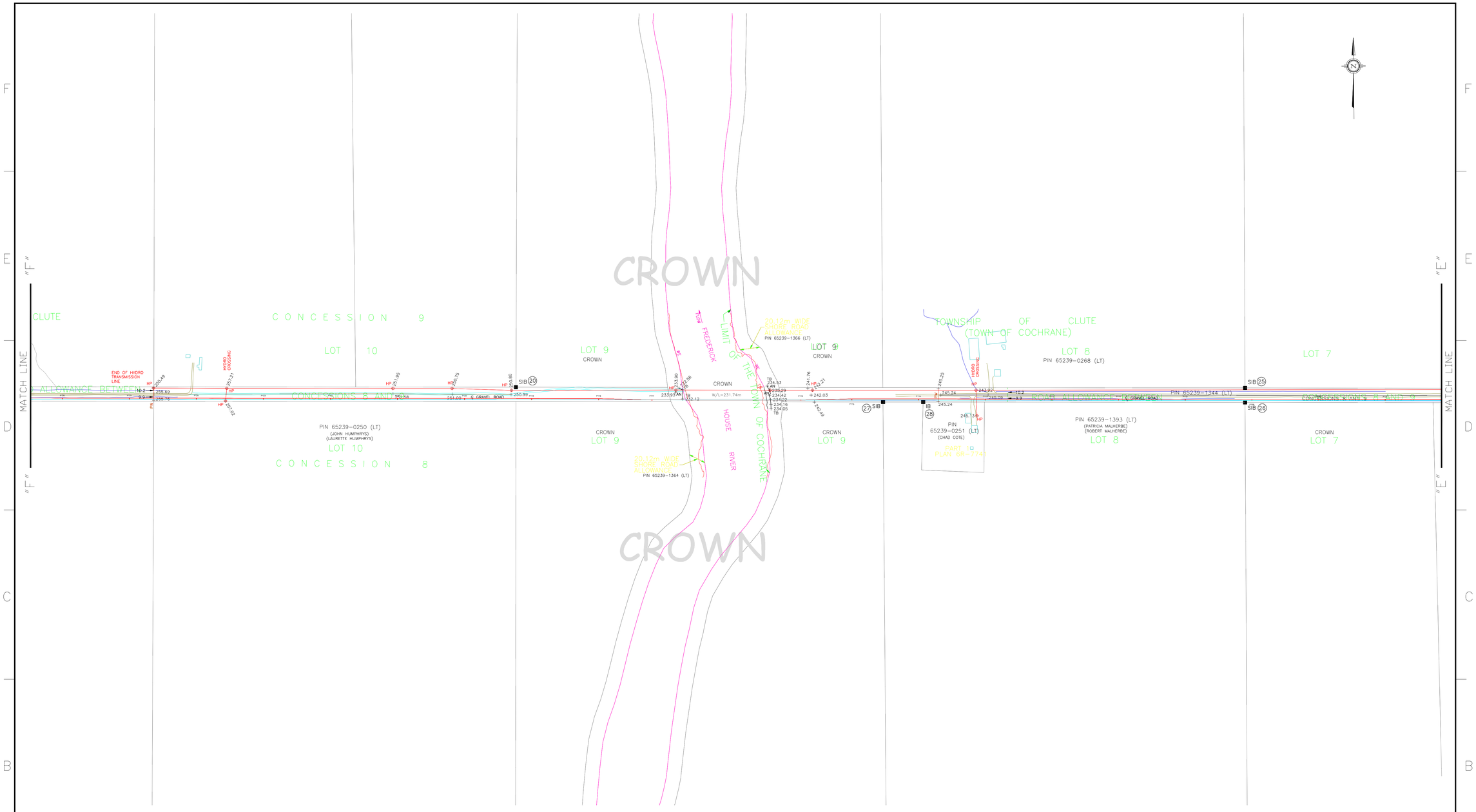
CLIENT DWG. NO.

DRAWING NO. 1250-P001-S05

REV. A

CAD FILE: 1250-P001-A



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	BY	DDMMYY
DSN	E.KWONG	19/11/12
DRN	M.HUANG	19/11/12
CHK		
APP		

AREA: NORTHLAND POWER INC.
COCHRANE SOLAR PROJECTS

SUBJECT
115kV TRANSMISSION LINE
OVERALL SITE PLAN
SHEET 6

NORTHLAND POWER

Chimax Inc.
Engineering Company
3950 Fourteenth Ave. East, Suite 506
Markham, On., L3R 0A9
Email: chimax@chimax.ca

CLIENT DWG. NO.

DRAWING NO. 1250-P001-S06

REV. A

CAD FILE: 1250-P001-A

CROWN

CROWN

CROWN

LOT 14
CROWN

LOT 13

LOT 12
CROWN

TOWNSHIP OF

LOT 11
CROWN

MATCH LINE "G"

MATCH LINE "F"

SIB 21

SIB 19

11.5
8.6
262.67

260.70
260.45
10.3
9.8

BETWEEN LOTS 12 AND 13
PIN 65239-1326 (LT)

ROAD ALLOWANCE
PIN 65239-1329 (LT)

GRAVEL ROAD

PIN 65239-1345 (LT)

PIN 65239-0247 (LT)
(TIMMINS FOREST PRODUCTS LTD)

LOT 14

CROWN
LOT 13

PIN 65239-0248 (LT)
(WILLIAM JAMES GRAHAM)
(STACEY EVELYN GRAHAM)

LOT 12

CROWN
LOT 11

CONCESSION 8
LOT 13

LOT 12
CONCESSION 8

CROWN

3' GRAVEL ROAD

(LT)

CROWN

REV	DDMMYY	REVISION	DR	CHK	APP	APP	APP	APP
A	20/11/12	CONCEPTUAL ISSUED	M.H.	E.K.				

ISS	DDMMYY	ISSUED FOR	APP
A	20/11/12	ISSUED FOR REVIEW	

REF	NUMBER	TITLE

REFERENCES

STAMP/SEAL

CLIENT PROJECT MGR. DEPARTMENT MGR. PROJECT MGR.

PROJECT PHASE

PROJECT NO.

ACTIVITY NO.

SCALE
N.T.S.

PACKAGE CODE

	BY	DDMMYY
DSN	E.KWONG	19/11/12
DRN	M.HUANG	19/11/12
CHK		
APP		

AREA
NORTHLAND POWER INC.
COCHRANE SOLAR PROJECTS

SUBJECT
115kV TRANSMISSION LINE
OVERALL SITE PLAN
SHEET 7

NORTHLAND POWER

Chimax Inc.
Engineering Company
3950 Fourteenth Ave, East, Suite 506
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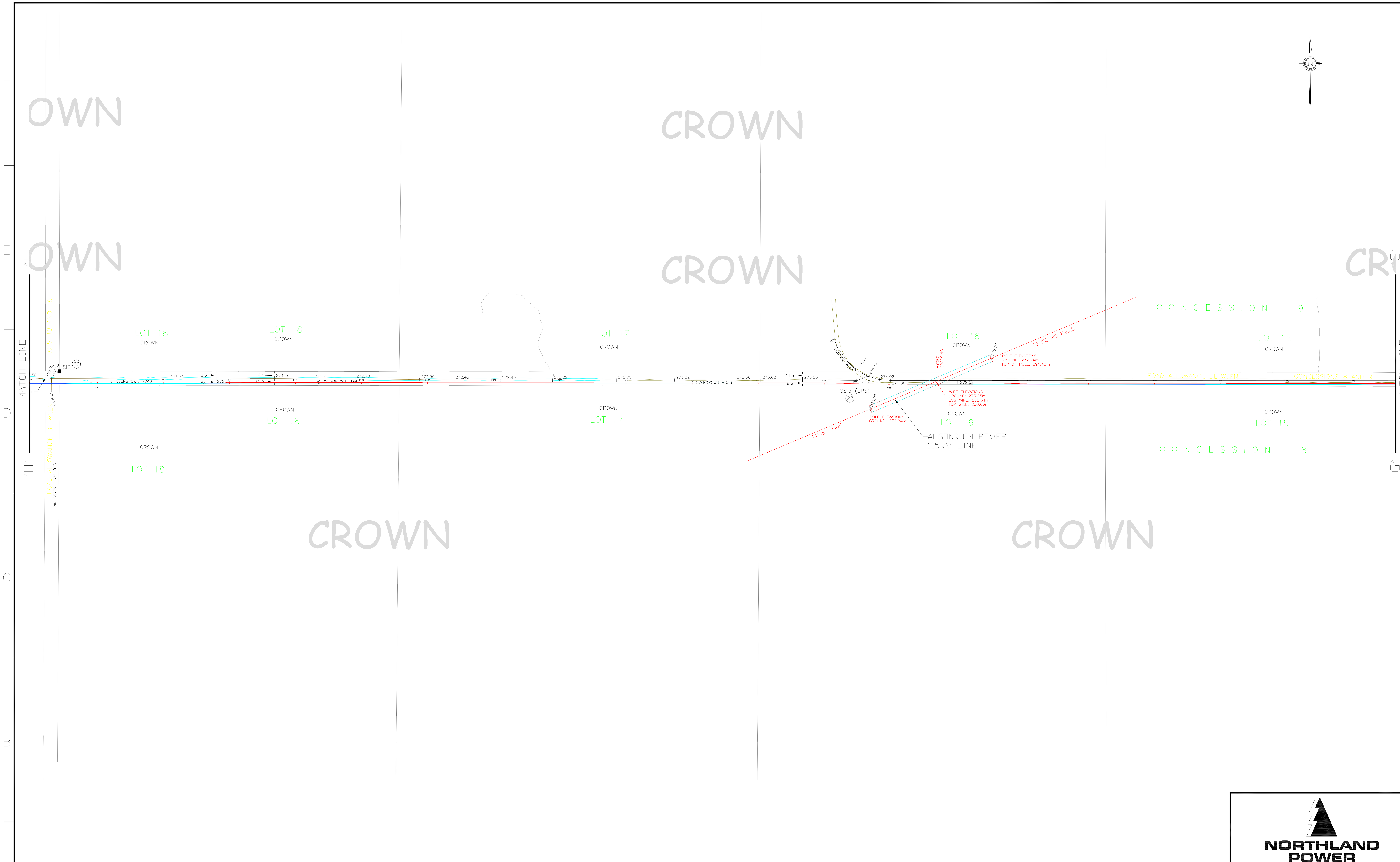
Email: chimax@chimax.ca

CLIENT DWG. NO.

DRAWING NO.
1250-P001-S07

REV.
A

CAD FILE: 1250-P001-A



REV	DDMMYY	REVISION	DR	CHK	APP	APP	APP	APP
A	20/11/12	CONCEPTUAL ISSUED	M.H.	E.K.				

ISS	DDMMYY	APP	ISSUED FOR
A	20/11/12		ISSUED FOR REVIEW

REFERENCES

REF	NUMBER	TITLE

STAMP/SEAL

CLIENT PROJECT MGR. DEPARTMENT MGR. PROJECT MGR.

PROJECT PHASE

AREA: NORTHLAND POWER INC. COCHRANE SOLAR PROJECTS

PROJECT NO.	ACTIVITY NO.		BY	DDMMYY
		DSN	E.KWONG	19/11/12
		DRN	M.HUANG	19/11/12
SCALE: N.T.S.	PACKAGE CODE	CHK		
		APP		

SUBJECT:

115kV TRANSMISSION LINE
OVERALL SITE PLAN
SHEET 8

NORTHLAND POWER

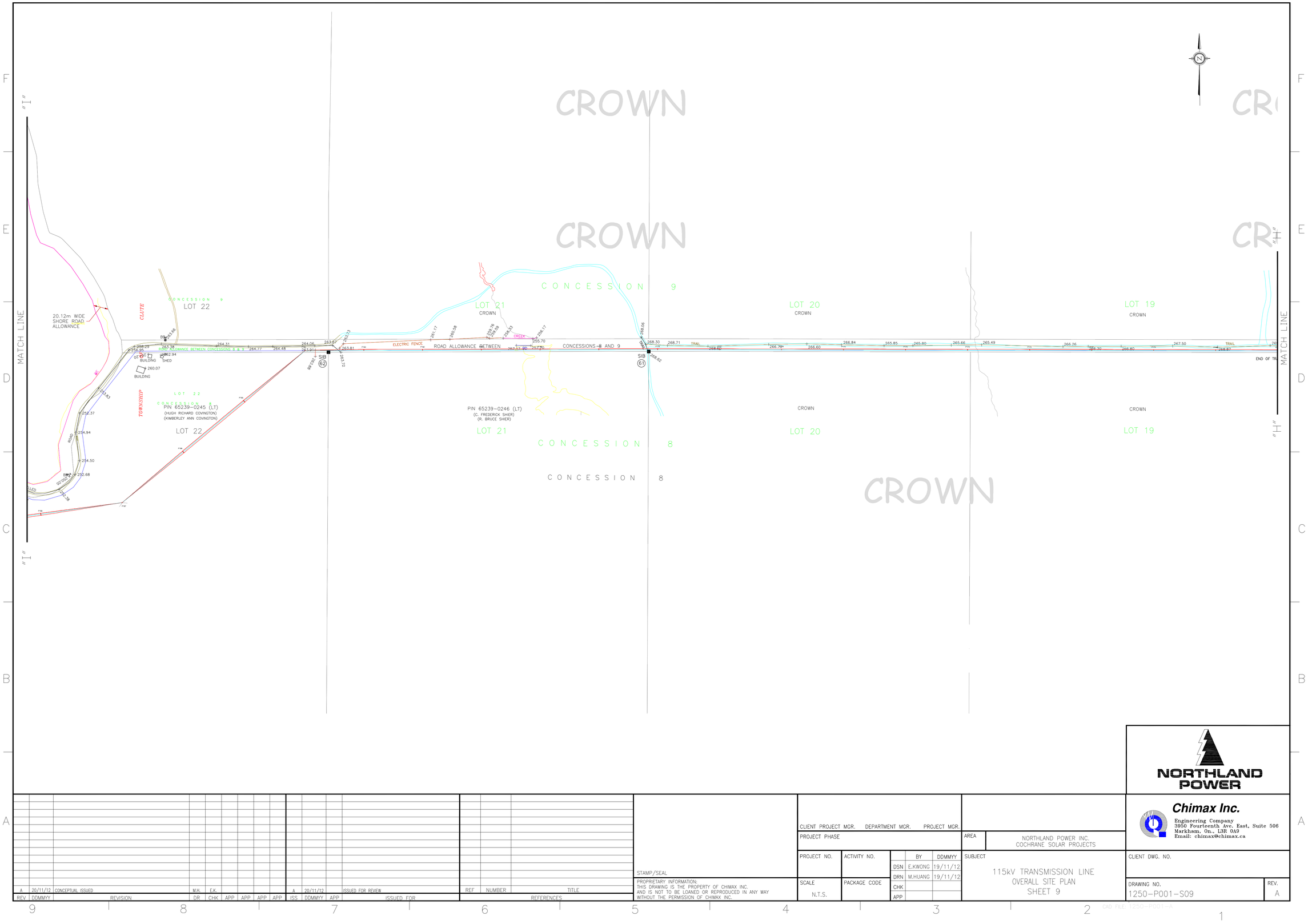
Chimax Inc.
Engineering Company
3950 Fourteenth Ave. East, Suite 506
Markham, On., L3R 0A9
Email: chimax@chimax.ca

CLIENT DWG. NO.

DRAWING NO. 1250-P001-S08

REV. A

CAD FILE: 1250-P001-A



REV	DDMMYY	REVISION	DR	CHK	APP	APP	APP	APP
A	20/11/12	CONCEPTUAL ISSUED	M.H.	F.K.				

ISS	DDMMYY	ISSUED FOR	APP
A	20/11/12	ISSUED FOR REVIEW	

REF	NUMBER	TITLE

REFERENCES

STAMP/SEAL

CLIENT PROJECT MGR. DEPARTMENT MGR. PROJECT MGR.

PROJECT PHASE

PROJECT NO. | ACTIVITY NO.

SCALE: N.T.S. | PACKAGE CODE

	BY	DDMMYY
DSN	E.KWONG	19/11/12
DRN	M.HUANG	19/11/12
CHK		
APP		

AREA: NORTHLAND POWER INC. COCHRANE SOLAR PROJECTS

SUBJECT: 115kV TRANSMISSION LINE OVERALL SITE PLAN SHEET 9

NORTHLAND POWER

Chimax Inc.
Engineering Company
3950 Fourteenth Ave. East, Suite 506
Markham, On., L3R 0A9
Email: chimax@chimax.ca

CLIENT DWG. NO.

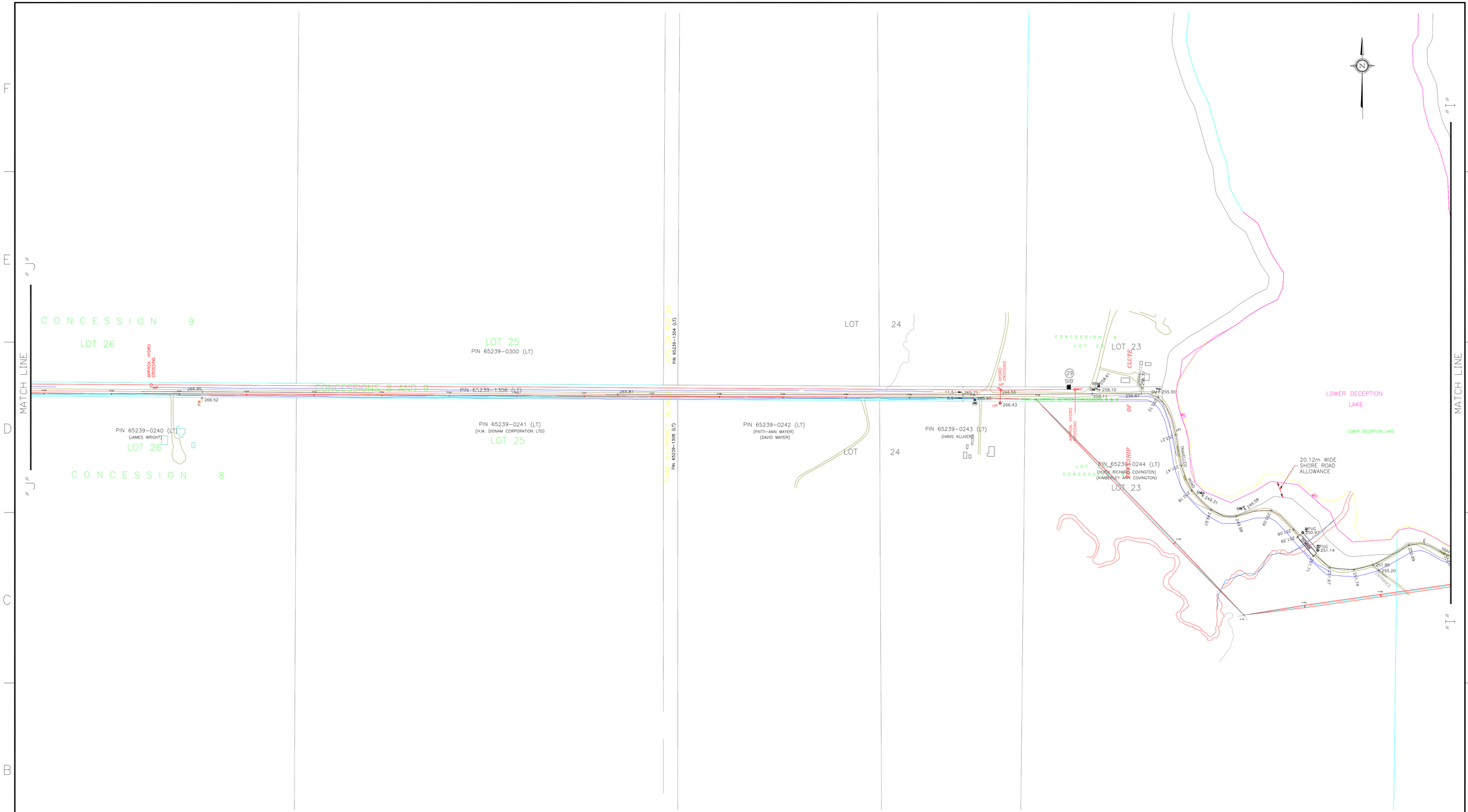
DRAWING NO. 1250-P001-S09

REV. A

CAD FILE: 1250-P001-A

TENTHS 0 INCHES 1 2 3 4 5 6 7 8 9 10 EIGHTHS

0 MM 10 20 30 40 50 60 70 80 90 100



REV	DDMMYY	REVISION	DR	CHK	APP	APP	APP	APP
A	20/11/12	CONCEPTUAL ISSUED	M.H.	E.K.				

ISS	DDMMYY	APP	ISSUED FOR
A	20/11/12		ISSUED FOR REVIEW

REF	NUMBER	TITLE

REFERENCES

STAMP/SEAL

CLIENT PROJECT MGR. DEPARTMENT MGR. PROJECT MGR.

PROJECT PHASE

AREA: NORTHLAND POWER INC. COCHRANE SOLAR PROJECTS

PROJECT NO.

ACTIVITY NO.

SCALE: N.T.S.

PACKAGE CODE

	BY	DDMMYY
DSN	E.KWONG	19/11/12
DRN	M.HUANG	19/11/12
CHK		
APP		

SUBJECT: 115kV TRANSMISSION LINE OVERALL SITE PLAN SHEET 10

NORTHLAND POWER

Chimax Inc.
Engineering Company
3950 Fourteenth Ave. East, Suite 506
Markham, On., L3R 0A9
Email: chimax@chimax.ca

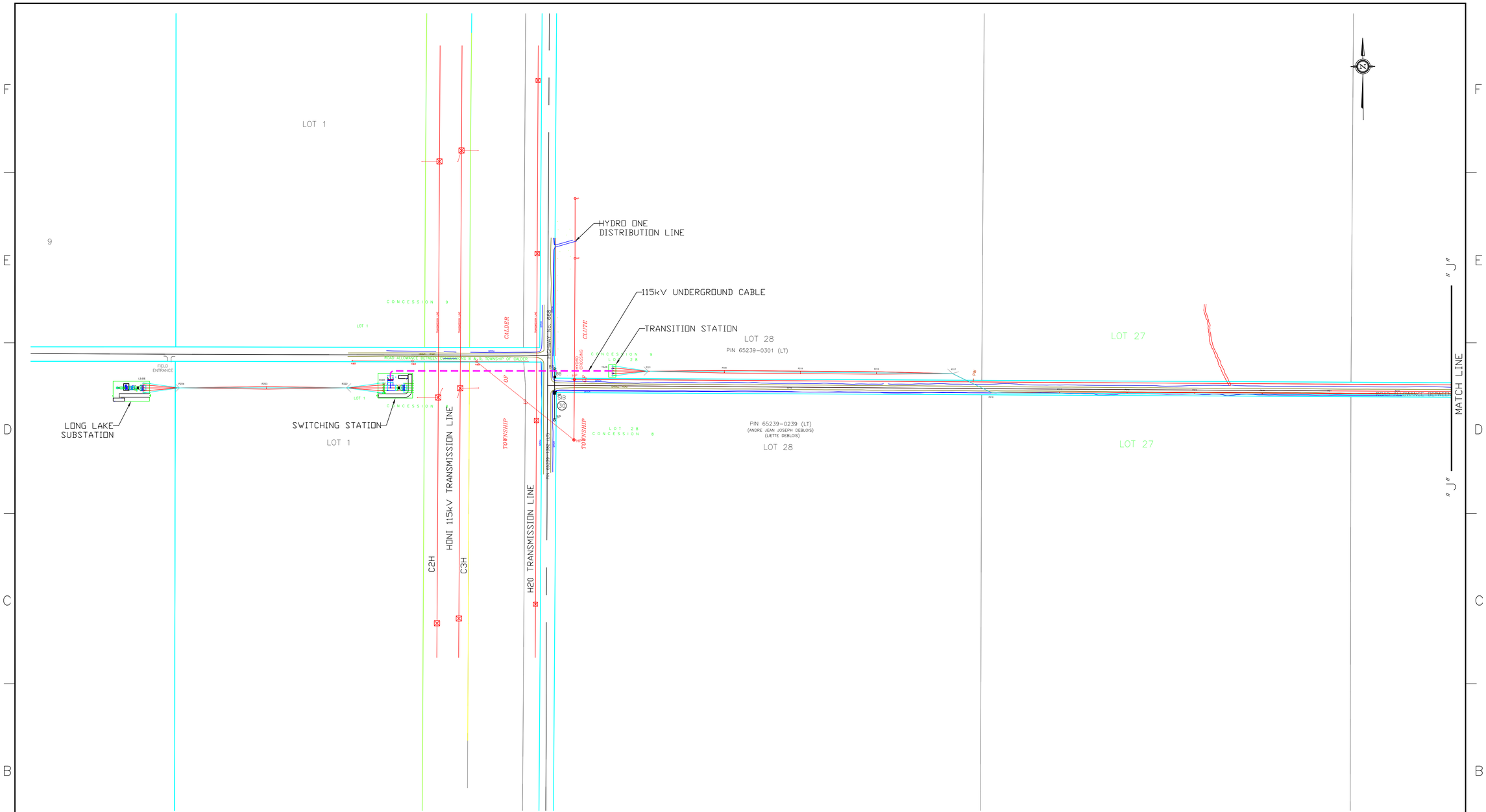
CLIENT DWG. NO.

DRAWING NO. 1250-P001-S10

REV. A

CAD FILE 1250-P001-A

9 8 7 6 5 4 3 2 1



REV	DDMMYY	REVISION	DR	CHK	APP	APP	APP	APP
C	11/12/12	CONCEPTUAL ISSUED	M.H.	E.K.				
B	30/11/12	CONCEPTUAL ISSUED	M.H.	E.K.				
A	22/11/12	CONCEPTUAL ISSUED	M.H.	E.K.				

ISS	DDMMYY	APP	ISSUED FOR
C	11/12/12		ISSUED FOR REVIEW
B	30/11/12		ISSUED FOR REVIEW
A	22/11/12		ISSUED FOR REVIEW

REF	NUMBER	TITLE

REFERENCES

STAMP/SEAL

CLIENT PROJECT MGR. DEPARTMENT MGR. PROJECT MGR.

PROJECT PHASE

PROJECT NO.

ACTIVITY NO.

SCALE
N.T.S.

PACKAGE CODE

	BY	DDMMYY
DSN	E.KWONG	21/11/12
DRN	M.HUANG	21/11/12
CHK		
APP		

AREA
NORTHLAND POWER INC.
COCHRANE SOLAR PROJECTS

SUBJECT
115kV TRANSMISSION LINE
OVERALL SITE PLAN
SHEET 11

NORTHLAND POWER

Chimax Inc.
Engineering Company
3950 Fourteenth Ave. East, Suite 506
Markham, On., L3R 0A9
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CLIENT DWG. NO.

DRAWING NO.
1250-P001-S11C

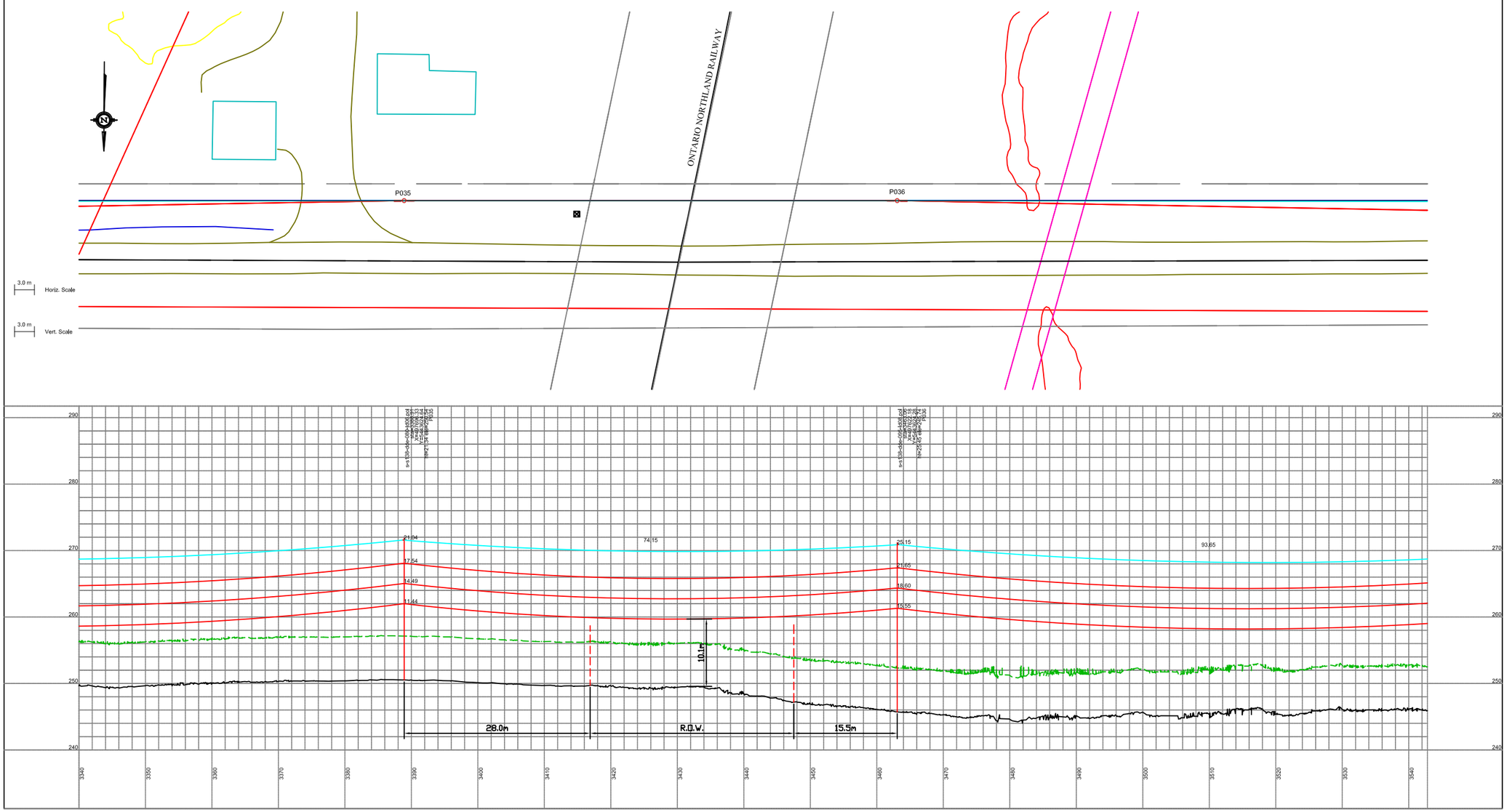
REV.
C

CAD FILE: 1250-P001-S11C-C

PROJECT DETAILS

Profile Drawings and Stringing Charts

PLS-CADD Drawing



PLAN & PROFILE LEGEND:

- 115kV LINE CONDUCTOR (336MCM ACSR LINNET)
- OPGW
- GROUND CLEARANCE LINE

STRUCTURE DESCRIPTION LEGEND:

w-s138-02vbp-075-1.pol	PLS-POLE FILE IDENTIFICATION
sta	STATION CHAINAGE
X	UTM EASTING
Y	UTM NORTHING
ht	STRUCTURE HEIGHT ABOVE GROUND (M)
ele	GROUND ELEVATION (M)
P034	STRUCTURE NO.

NOTES:

1. GROUND CLEARANCE LINE SHOWN AT 6.6 M (FOR VEHICULAR TRAFFIC).
2. GROUND CLEARANCE LINE SHOWN AT 9.0 M (FOR RAILWAY CROSSING)
3. CONDUCTOR (336MCM ACSR LINNET) SAG AT 100°C.
4. OPGW SAG AT 40°C.

REV	DDMMYY	REVISION	DR	CHK	APP	APP	APP	APP
B	11/12/12	CONCEPTUAL ISSUED	M.H.	E.K.				
A	20/11/12	CONCEPTUAL ISSUED	M.H.	E.K.				

ISS	DDMMYY	APP	ISSUED FOR
B	11/12/12		ISSUED FOR REVIEW
A	20/11/12		ISSUED FOR REVIEW

REF	NUMBER	REFERENCES TITLE

STAMP/SEAL

CLIENT PROJECT MGR. DEPARTMENT MGR. PROJECT MGR.

PROJECT PHASE

PROJECT NO. | ACTIVITY NO. | SCALE N.T.S. | PACKAGE CODE

	BY	DDMMYY
DSN	E.KWONG	09/11/12
DRN	M.HUANG	09/11/12
CHK		
APP		

AREA: NORTHLAND POWER INC. COCHRANE SOLAR PROJECTS

SUBJECT: PLAN & PROFILE DRAWINGS ONTARIO NORTHLAND RAILWAY CROSSING SECTION SHEET 1

NORTHLAND POWER

Chimax Inc.
Engineering Company
3960 Fourteenth Ave. East, Suite 506
Markham, On., L3R 0A9
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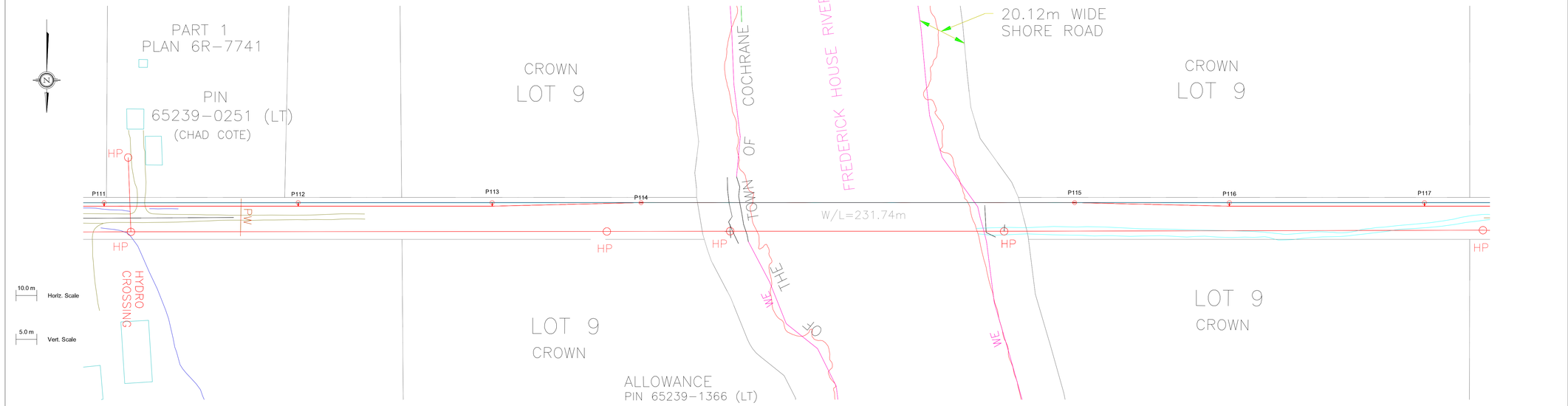
CLIENT DWG. NO.

DRAWING NO. 1250-P010

REV. B

CAD FILE: 1250-P010-B

PLS-CADD Drawing



PLAN & PROFILE LEGEND:

- 115kV LINE CONDUCTOR (336MCM ACSR LINNET)
- OPGW
- GROUND CLEARANCE LINE

STRUCTURE DESCRIPTION LEGEND:

w-s138-02vbp-075-1.pol	PLS-POLE FILE IDENTIFICATION
sta	STATION CHAINAGE
X	UTM EASTING
Y	UTM NORTHING
ht	STRUCTURE HEIGHT ABOVE GROUND (M)
ele	GROUND ELEVATION (M)
P112	STRUCTURE NO.

NOTES:

1. GROUND CLEARANCE LINE SHOWN AT 6.6 M (FOR VEHICULAR TRAFFIC).
2. GROUND CLEARANCE LINE SHOWN AT 13.0 M (FOR RIVER CROSSING)
3. CONDUCTOR (336MCM ACSR LINNET) SAG AT 100°C.
4. OPGW SAG AT 40°C.

NORTHLAND POWER

Chimax Inc.
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3950 Fourteenth Ave. East, Suite 506
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REV	DDMMYY	REVISION	DR	CHK	APP	APP	APP	APP
A	20/11/12	CONCEPTUAL ISSUED	M.H.	E.K.				

ISS	DDMMYY	APP	ISSUED FOR
A	20/11/12		ISSUED FOR REVIEW

REF	NUMBER	TITLE
		REFERENCES

STAMP/SEAL

CLIENT PROJECT MGR. DEPARTMENT MGR. PROJECT MGR.

PROJECT PHASE

AREA: NORTHLAND POWER INC. COCHRANE SOLAR PROJECTS

PROJECT NO.	ACTIVITY NO.		BY	DDMMYY
		DSN	E.KWONG	09/11/12
		DRN	M.HUANG	09/11/12
		CHK		
		APP		

SCALE: N.T.S.

PACKAGE CODE

SUBJECT: PLAN & PROFILE DRAWINGS
FREDERICK HOUSE RIVER CROSSING SECTION
SHEET 1

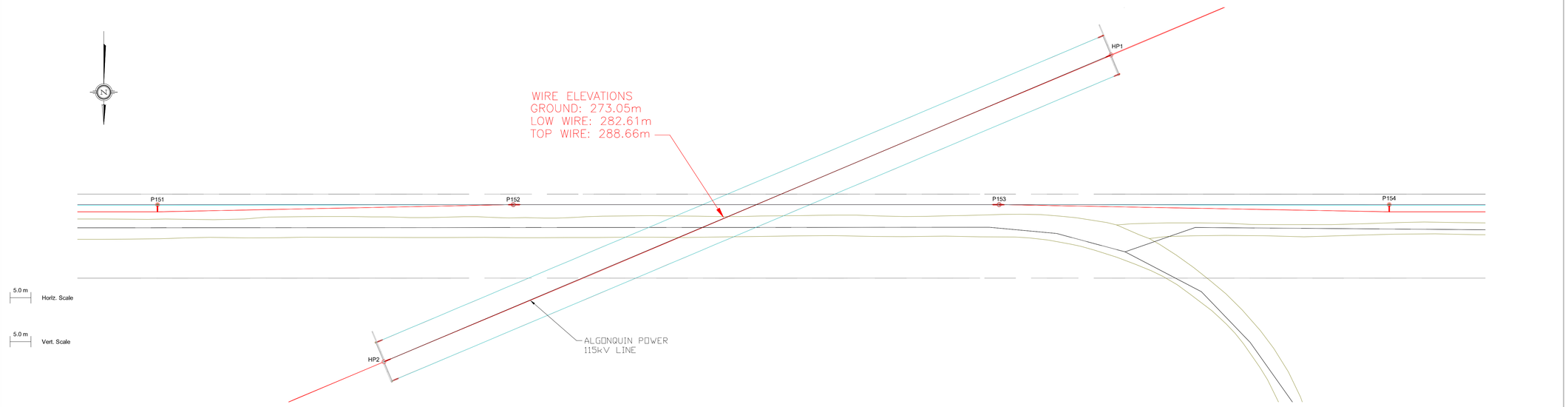
CLIENT DWG. NO.

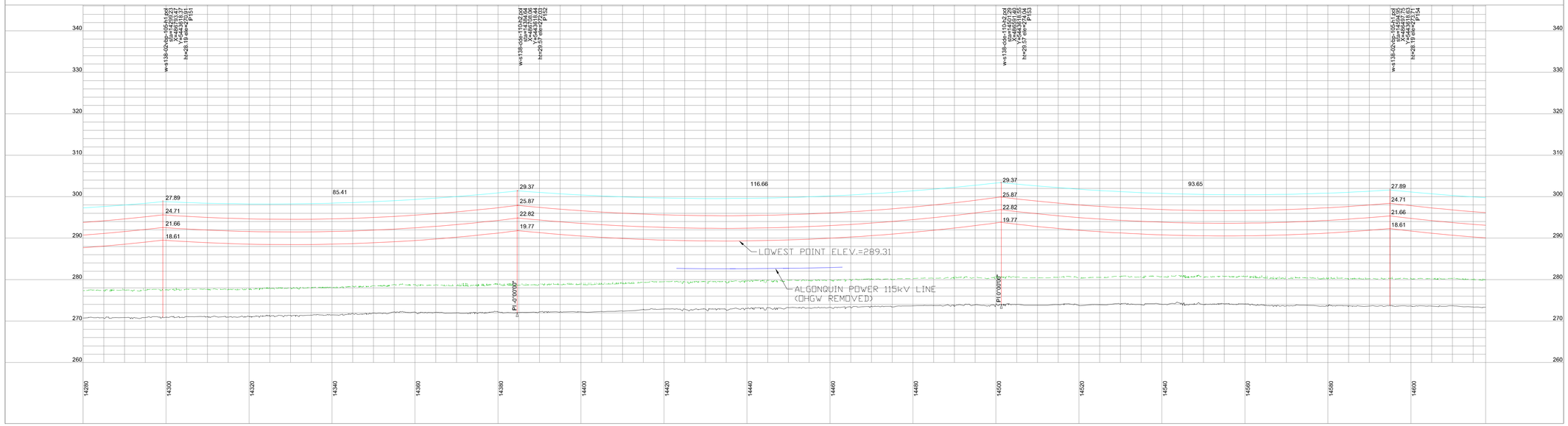
DRAWING NO.: 1250-P011

REV.: A

CAD FILE: 1250-P011-A

PLS-CADD Drawing





PLAN & PROFILE LEGEND:

- 115kV LINE CONDUCTOR (336MCM ACSR LINNET)
- OPGW
- ALGONQUIN POWER 115kV LINE
- GROUND CLEARANCE LINE

STRUCTURE DESCRIPTION LEGEND:

w-s138-02vbp-120-h2.pol	PLS-POLE FILE IDENTIFICATION
sta	STATION CHAINAGE
X	UTM EASTING
Y	UTM NORTHING
ht	STRUCTURE HEIGHT ABOVE GROUND (M)
ele	GROUND ELEVATION (M)
P151	STRUCTURE NO.

NOTES:

1. GROUND CLEARANCE LINE SHOWN AT 6.6 M (FOR VEHICULAR TRAFFIC).
2. CONDUCTOR (336MCM ACSR LINNET) SAG AT 100°C.
3. OPGW SAG AT 40°C.

REV	DDMMYY	REVISION	DR	CHK	APP	APP	APP	APP
A	20/11/12	CONCEPTUAL ISSUED	M.H.	E.K.				

ISS	DDMMYY	ISSUED FOR	REF.	NUMBER	TITLE
A	20/11/12	ISSUED FOR REVIEW			REFERENCES

STAMP/SEAL

CLIENT PROJECT MGR. DEPARTMENT MGR. PROJECT MGR.

PROJECT PHASE

PROJECT NO. | ACTIVITY NO.

SCALE: N.T.S. | PACKAGE CODE

	BY	DDMMYY
DSN	E.KWONG	09/11/12
DRN	M.HUANG	09/11/12
CHK		
APP		

AREA: NORTHLAND POWER INC. COCHRANE SOLAR PROJECTS

SUBJECT: PLAN & PROFILE DRAWINGS ALGONQUIN POWER 115kV LINE CROSSING SECTION OPTION 2 SHEET 1

NORTHLAND POWER

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Engineering Company
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Email: chimax@chimax.ca

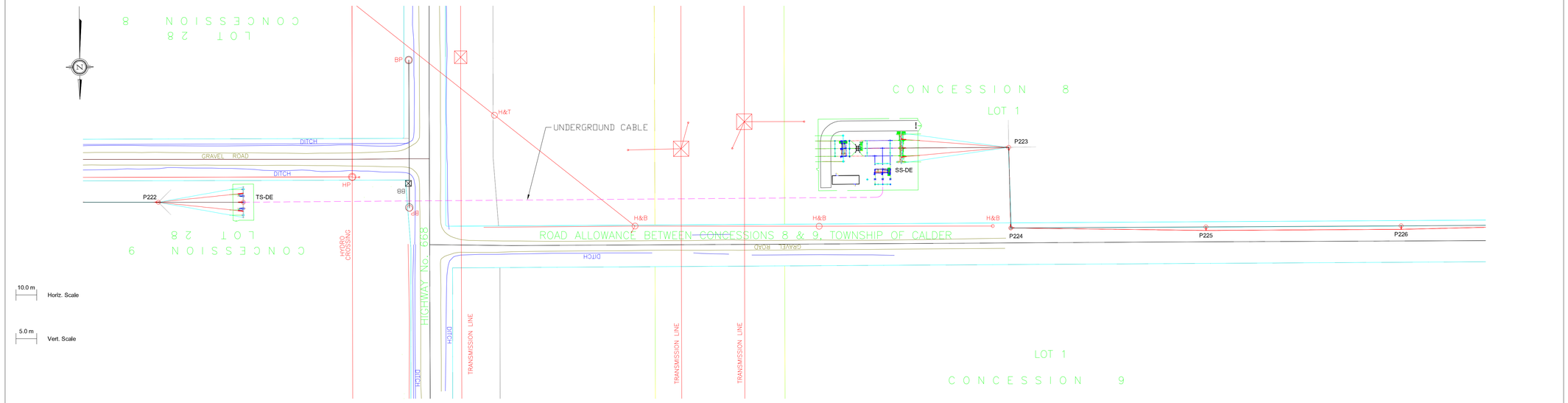
CLIENT DWG. NO.

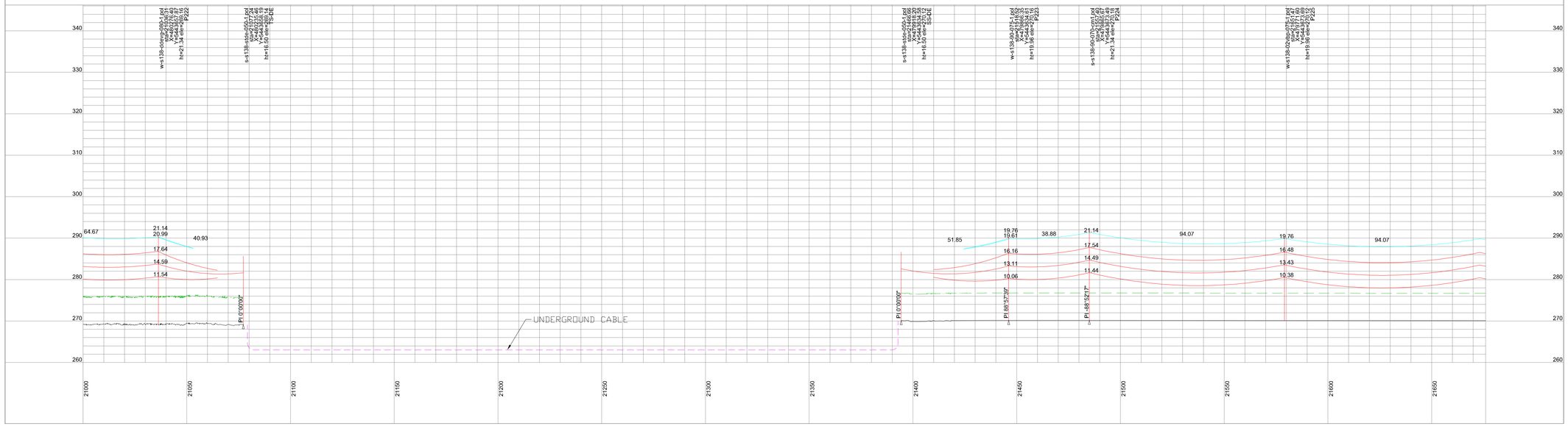
DRAWING NO.: 1250-P012B

REV.: A

CAD FILE: 1250-P012B-A

PLS-CADD Drawing





PLAN & PROFILE LEGEND:

- 115kV LINE CONDUCTOR (336MCM ACSR LINNET)
- OPGW
- UNDERGROUND CABLE
- GROUND CLEARANCE LINE

STRUCTURE DESCRIPTION LEGEND:

w-s138-ddevg-080-1.pol	PLS-POLE FILE IDENTIFICATION
sta	STATION CHAINAGE
X	UTM EASTING
Y	UTM NORTHING
ht	STRUCTURE HEIGHT ABOVE GROUND (M)
ele	GROUND ELEVATION (M)
P222	STRUCTURE NO.

NOTES:

1. GROUND CLEARANCE LINE SHOWN AT 6.6 M (FOR VEHICULAR TRAFFIC).
2. CONDUCTOR (336MCM ACSR LINNET) SAG AT 100°C.
3. OPGW SAG AT 40°C.

REV	DDMMYY	REVISION	DR	CHK	APP	APP	APP	APP
A	21/11/12	CONCEPTUAL ISSUED	M.H.	E.K.				

ISS	DDMMYY	APP	ISSUED FOR
A	21/11/12		ISSUED FOR REVIEW

REF	NUMBER	TITLE

REFERENCES

STAMP/SEAL

CLIENT PROJECT MGR. DEPARTMENT MGR. PROJECT MGR.

PROJECT PHASE

PROJECT NO. | ACTIVITY NO.

SCALE: N.T.S. | PACKAGE CODE

	BY	DDMMYY
DSN	E.KWONG	21/11/12
DRN	M.HUANG	21/11/12
CHK		
APP		

AREA: NORTHLAND POWER INC. COCHRANE SOLAR PROJECTS

SUBJECT: PLAN & PROFILE DRAWINGS UNDERGROUND CROSSING SECTION SHEET 1

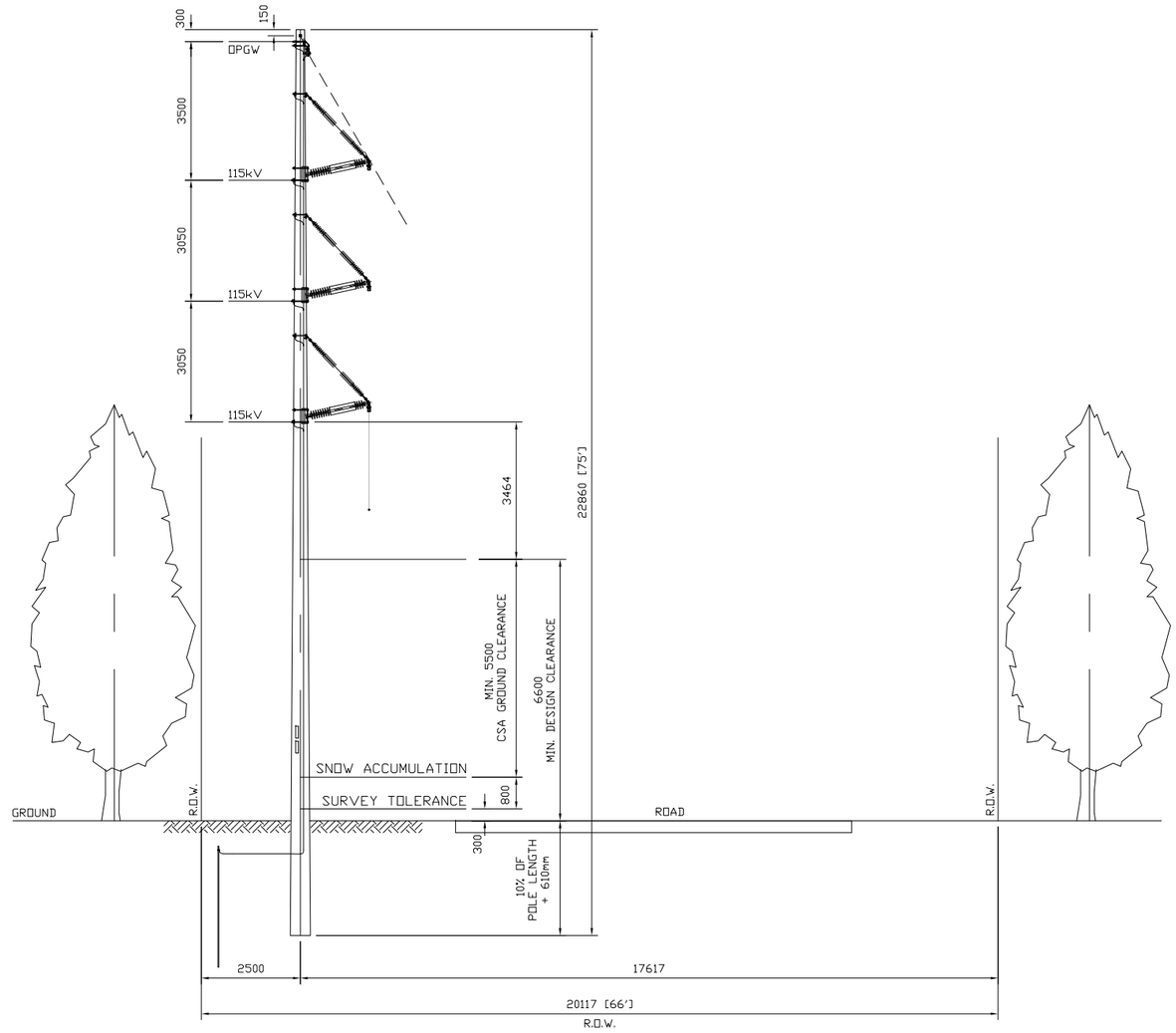
NORTHLAND POWER

Chimax Inc.
Engineering Company
3950 Fourteenth Ave. East, Suite 506
Markham, On., L3R 0A9
Email: chimax@chimax.ca

CLIENT DWG. NO.

DRAWING NO. 1250-P013B | REV. A

CAD FILE: 1250-P013B-A



115kV TRANSMISSION LINE
TANGENT STRUCTURES
CONCEPTUAL RIGHT OF WAY DESIGN

DESIGN NOTES:

THE PROPOSED STRUCTURE FRAMING, POLE REQUIREMENT AND RECOMMENDATION STANDARD SPAN ARE BASED ON THE FOLLOWING DESIGN DATA:

A. DESIGN CRITERIA

1. METEOROLOGICAL LOCATION:	COCHRANE
2. MINIMUM DESIGN LOADING	
2.1. CSA 22.3 No.1 (LIMIT STATE DESIGN) - CSA HEAVY CONDITION	
HOURLY WIND	400 Pa
RADIAL ICE THICKNESS	12.7 mm (1/2")
CONDUCTOR TEMPERATURE	-20°C
2.2. CSA 22.3 No.60826 (IEC RELIABILITY DESIGN) - 1/50 PERIOD	
(i) IEC ICE (1/50)	17 mm @ -10°C
(ii) IEC WIND (1/50)	80 km/h (302.7 Pa) @ -10°C
(iii) COMBINED ICE (85%) & WIND (60%)	14.5 mm & 109 Pa @ -10°C
WIRE ADJUSTMENT MODELS & MATERIAL FACTORS AS PER CSA 22.3 No. 60826.	

B. CLEARANCE CRITERIA

1. MEAN ANNUAL SNOW ACCUMULATION:	0.8 m
2. ADDITIONAL SURVEY TOLERANCE:	0.3 m
3. VERTICAL GROUND CLEARANCE:	
3.1. MINIMUM CSA 22.3 No.1 VERTICAL GROUND CLEARANCE	
115kV / 138kV CONDUCTOR	5.50 m
3.2. DESIGN VERTICAL GROUND CLEARANCE	
115kV / 138kV CONDUCTOR	6.60 m
4. VERTICAL GROUND CLEARANCE LOADING CONDITIONS	
4.1. PHASE CONDUCTOR	
(i) MAXIMUM CONDUCTOR TEMPERATURE	100°C
(ii) DESIGN CONDUCTOR TEMPERATURE (AS PER IEEE STD. 738)	80°C
(iii) RADIAL ICE THICKNESS (CLEARANCE)	12.7 mm (1/2")
5. PHASE CLEARANCE CONDITIONS:	
(i) HOURLY WIND (NATIONAL BUILDING CODE 1/50)	350 Pa (~86 km/hr)
(ii) HOURLY WIND (NATIONAL BUILDING CODE 1/30)	320 Pa (~82 km/hr)
(iii) GALLOPING	
GALLOPING SWING	290 Pa
GALLOPING ICE	12.7 mm (1/2")

C. WIND POWER PROJECT CIRCUITS DATA

1. MERCHANT CIRCUIT(S)	
1.1. NOMINAL SYSTEM VOLTAGE	124 kV
1.2. NUMBER OF PHASES	3(THREE)
1.3. SYSTEM FREQUENCY	60 Hz
1.4. SYSTEM GROUNDING	LOW IMPEDANCE
1.5. NUMBER OF CIRCUIT	1 (ONE)
1.6. MAXIMUM CIRCUIT CURRENT	270A PER CIRCUIT
1.7. PHASE CONDUCTOR SIZE	477 MCM ACSR (HAWK)
1.8. DESIGN CONDUCTOR TEMPERATURE	80°C

REV	D/M/Y	REVISION	M.H.	E.K.				
			DR	CHK	APP	APP	APP	APP
A	16/08/12	CONCEPTUAL ISSUE						

ISS	D/M/Y	ISSUED FOR	REF	NUMBER	TITLE
A	16/08/12	ISSUED FOR REVIEW			
APP		ISSUED FOR			REFERENCES

STAMP/SEAL

APPROVED FOR CONSTRUCTION

CLIENT PROJECT MGR. DEPARTMENT MGR. PROJECT MGR.

PROJECT PHASE

PROJECT NO.	ACTIVITY NO.	PACKAGE CODE

SCALE	BY	D/M/Y
N.T.S. (11"x17")	DSN. E.KWONG	16/08/12
	DRN. M.HUANG	16/08/12

AREA: NORTHLAND POWER INC. COCHRANE SOLAR PROJECTS

SUBJECT: 1CCT 115kV TRANSMISSION LINE TANGENT STRUCTURES CONCEPTUAL RIGHT OF WAY DESIGN

CLIENT DWG. NO.

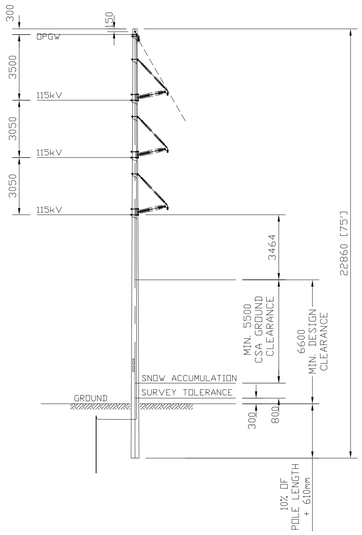
DRAWING NO. 1250-P003

REV. A

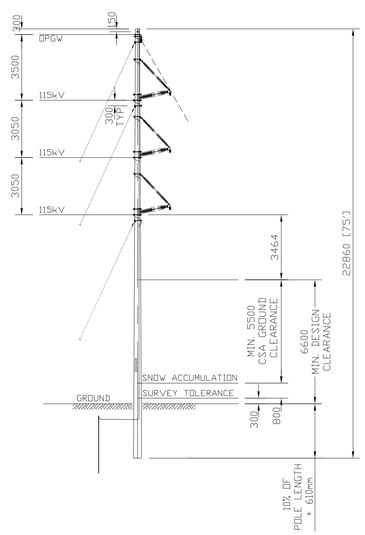
CADD FILE ADDRESS 1250-P003-A

NORTHLAND POWER

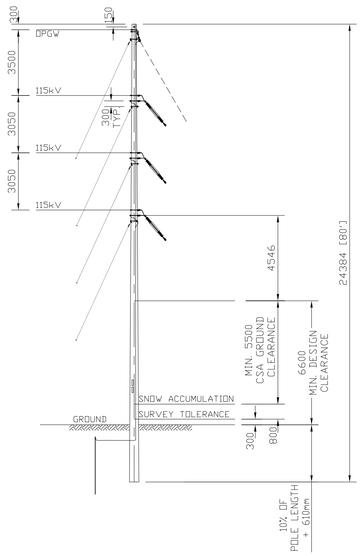
Chimax Inc.
Engineering Company
3950 Fourteenth Ave. East, Suite 506
Markham, On., L3R 0A9
Email: chimax@chimax.ca



1CCT 115kV TRANSMISSION LINE
TANGENT (0 - 2°) FRAMING



1CCT 115kV TRANSMISSION LINE
LIGHT ANGLE (2 - 15°) FRAMING



1CCT 115kV TRANSMISSION LINE
MEDIUM ANGLE (15 - 30°) FRAMING

DESIGN NOTES:

THE PROPOSED STRUCTURE FRAMING, POLE REQUIREMENT AND RECOMMENDATION STANDARD SPAN ARE BASED ON THE FOLLOWING DESIGN DATA:

A. DESIGN CRITERIA

1. METEOROLOGICAL LOCATION:	COCHRANE
2. MINIMUM DESIGN LOADING	
2.1. CSA 22.3 No.1 (LIMIT STATE DESIGN) - CSA HEAVY CONDITION	
HOURLY WIND	400 Pa
RADIAL ICE THICKNESS	12.7 mm (1/2")
CONDUCTOR TEMPERATURE	-20°C
2.2. CSA 22.3 No.60826 (IEC RELIABILITY DESIGN) - 1/50 PERIOD	
(i) IEC ICE (1/50)	17 mm @ -10°C
(ii) IEC WIND (1/50)	80 km/h (302.7 Pa) @ -10°C
(iii) COMBINED ICE (85%) & WIND (60%)	14.5 mm & 109 Pa @ -10°C
WIRE ADJUSTMENT MODELS & MATERIAL FACTORS AS PER CSA 22.3 No. 60826.	

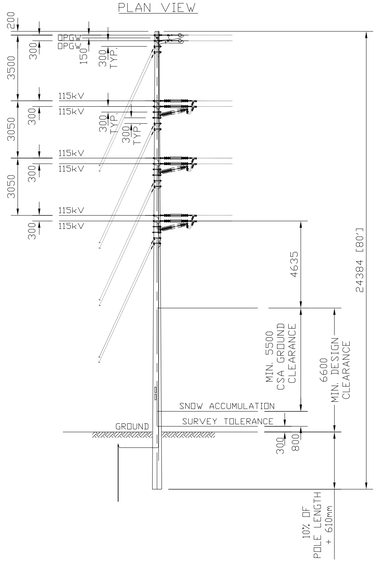
B. CLEARANCE CRITERIA

1. MEAN ANNUAL SNOW ACCUMULATION:	0.8 m
2. ADDITIONAL SURVEY TOLERANCE:	0.3 m
3. VERTICAL GROUND CLEARANCE:	
3.1. MINIMUM CSA 22.3 No.1 VERTICAL GROUND CLEARANCE	
115kV / 138kV CONDUCTOR	5.50 m
3.2. DESIGN VERTICAL GROUND CLEARANCE	
115kV / 138kV CONDUCTOR	6.60 m
4. VERTICAL GROUND CLEARANCE LOADING CONDITIONS	
4.1. PHASE CONDUCTOR	
(i) MAXIMUM CONDUCTOR TEMPERATURE	100°C
(ii) DESIGN CONDUCTOR TEMPERATURE (AS PER IEEE STD. 738)	80°C
(iii) RADIAL ICE THICKNESS (CLEARANCE)	12.7 mm (1/2")
5. PHASE CLEARANCE CONDITIONS:	
(i) HOURLY WIND (NATIONAL BUILDING CODE 1/50)	350 Pa (~86 km/hr)
(ii) HOURLY WIND (NATIONAL BUILDING CODE 1/30)	320 Pa (~82 km/hr)
(iii) GALLOPING	
GALLOPING SWING	290 Pa
GALLOPING ICE	12.7 mm (1/2")

C. WIND POWER PROJECT CIRCUITS DATA

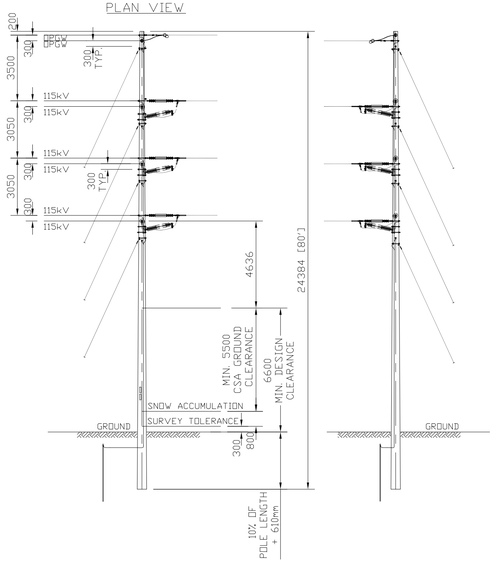
1. MERCHANT CIRCUIT(S)	
1.1. NOMINAL SYSTEM VOLTAGE	124 kV
1.2. NUMBER OF PHASES	3 (THREE)
1.3. SYSTEM FREQUENCY	60 Hz
1.4. SYSTEM GROUNDING	LOW IMPEDANCE
1.5. NUMBER OF CIRCUIT	1 (ONE)
1.6. MAXIMUM CIRCUIT CURRENT	270A PER CIRCUIT
1.7. PHASE CONDUCTOR SIZE	477 MCM ACSR (HAWK)
1.8. DESIGN CONDUCTOR TEMPERATURE	80°C

PLAN VIEW



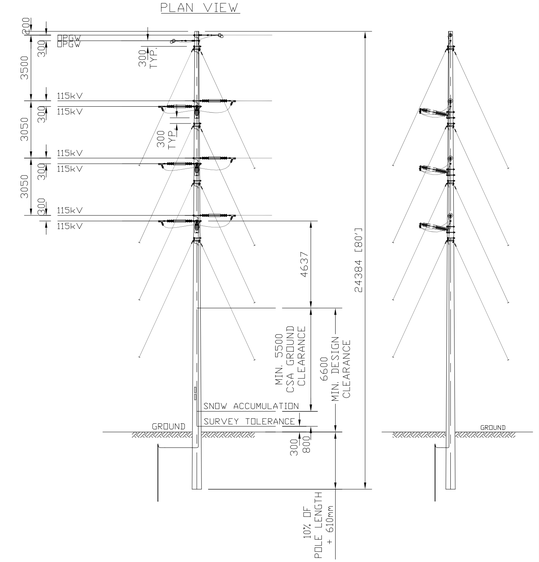
1CCT 115kV TRANSMISSION LINE
MEDIUM ANGLE (30- 60°) DEADEND FRAMING

PLAN VIEW



1CCT 115kV TRANSMISSION LINE
HEAVY ANGLE (60 - 90°) DEADEND FRAMING

PLAN VIEW



1CCT 115kV TRANSMISSION LINE
DOUBLE DEADEND FRAMING

REV	D/M/Y	REVISION	DR	CHK	APP	APP	APP	APP
A	16/08/12	CONCEPTUAL ISSUE	M.H.	E.K.				

ISS	D/M/Y	ISSUED FOR	REF	NUMBER	TITLE
A	16/08/12	ISSUED FOR REVIEW			

REFERENCES

STAMP/SEAL

APPROVED FOR CONSTRUCTION

CLIENT PROJECT MGR. DEPARTMENT MGR. PROJECT MGR.

PROJECT PHASE

PROJECT NO. | ACTIVITY NO. | PACKAGE CODE

SCALE

	BY	D/M/Y
DSN.	E.KWONG	16/08/12
DRN.	M.HUANG	16/08/12

AREA: NORTHLAND POWER INC. COCHRANE SOLAR PROJECTS

SUBJECT: 1CCT 115kV TRANSMISSION LINE
STRUCTURE SUMMARY

NORTHLAND POWER

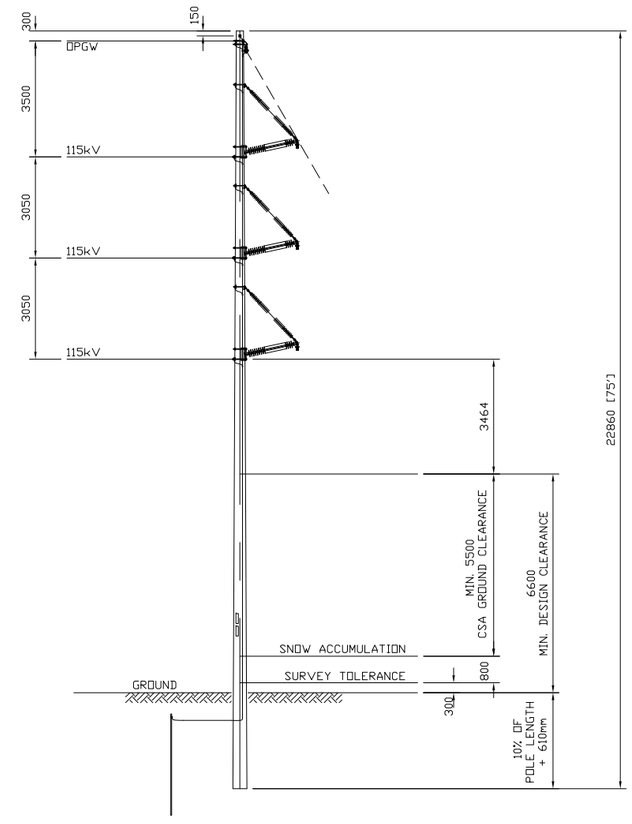
Chimax Inc.
Engineering Company
3950 Fourteenth Ave. East, Suite 506
Markham, On., L3R 0A9
Email: chimax@chimax.ca

CLIENT DWG. NO.

DRAWING NO. 1250-P021

REV. A

CADD FILE ADDRESS 1250-P021-A



1CCT 115kV TRANSMISSION LINE
TANGENT (0 - 2°) FRAMING

DESIGN NOTES:

THE PROPOSED STRUCTURE FRAMING, POLE REQUIREMENT AND RECOMMENDATION STANDARD SPAN ARE BASED ON THE FOLLOWING DESIGN DATA:

A. DESIGN CRITERIA

1. METEOROLOGICAL LOCATION:	COCHRANE
2. MINIMUM DESIGN LOADING	
2.1. CSA 22.3 No.1 (LIMIT STATE DESIGN) - CSA HEAVY CONDITION	
HOURLY WIND	400 Pa
RADIAL ICE THICKNESS	12.7 mm (1/2")
CONDUCTOR TEMPERATURE	-20°C
2.2. CSA 22.3 No.60826 (IEC RELIABILITY DESIGN) - 1/50 PERIOD	
(i) IEC ICE (1/50)	17 mm @ -10°C
(ii) IEC WIND (1/50)	80 km/h (302.7 Pa) @ -10°C
(iii) COMBINED ICE (85%) & WIND (60%)	14.5 mm & 109 Pa @ -10°C

WIRE ADJUSTMENT MODELS & MATERIAL FACTORS AS PER CSA 22.3 No. 60826.

B. CLEARANCE CRITERIA

1. MEAN ANNUAL SNOW ACCUMULATION:	0.8 m
2. ADDITIONAL SURVEY TOLERANCE:	0.3 m
3. VERTICAL GROUND CLEARANCE:	
3.1. MINIMUM CSA 22.3 No.1 VERTICAL GROUND CLEARANCE	
115kV / 138kV CONDUCTOR	5.50 m
3.2. DESIGN VERTICAL GROUND CLEARANCE	
115kV / 138kV CONDUCTOR	6.60 m
4. VERTICAL GROUND CLEARANCE LOADING CONDITIONS	
4.1. PHASE CONDUCTOR	
(i) MAXIMUM CONDUCTOR TEMPERATURE	100°C
(ii) DESIGN CONDUCTOR TEMPERATURE (AS PER IEEE STD. 738)	80°C
(iii) RADIAL ICE THICKNESS (CLEARANCE)	12.7 mm (1/2")
5. PHASE CLEARANCE CONDITIONS:	
(i) HOURLY WIND (NATIONAL BUILDING CODE 1/50)	350 Pa (~86 km/hr)
(ii) HOURLY WIND (NATIONAL BUILDING CODE 1/30)	320 Pa (~82 km/hr)
(iii) GALLOPING	
GALLOPING SWING	290 Pa
GALLOPING ICE	12.7 mm (1/2")

C. WIND POWER PROJECT CIRCUITS DATA

1. MERCHANT CIRCUIT(S)	
1.1. NOMINAL SYSTEM VOLTAGE	124 kV
1.2. NUMBER OF PHASES	3(THREE)
1.3. SYSTEM FREQUENCY	60 Hz
1.4. SYSTEM GROUNDING	LOW IMPEDANCE
1.5. NUMBER OF CIRCUIT	1 (ONE)
1.6. MAXIMUM CIRCUIT CURRENT	270A PER CIRCUIT
1.7. PHASE CONDUCTOR SIZE	477 MCM ACSR (HAWK)
1.8. DESIGN CONDUCTOR TEMPERATURE	80°C

REV	D/M/Y	REVISION	DR	CHK	APP	APP	APP	APP
A	16/08/12	CONCEPTUAL ISSUE	J.C.	E.K.				

ISS	D/M/Y	APP	ISSUED FOR	REF	NUMBER	TITLE
A	16/08/12		ISSUED FOR REVIEW			

REFERENCES

STAMP/SEAL

APPROVED FOR CONSTRUCTION

CLIENT PROJECT MGR. DEPARTMENT MGR. PROJECT MGR.

PROJECT PHASE

PROJECT NO. | ACTIVITY NO. | PACKAGE CODE

SCALE: N.T.S. (11"x17")

	BY	D/M/Y
DSM.	E.KWONG	15/08/12
DRN.	J.CHEN	15/08/12

AREA: NORTHLAND POWER INC. COCHRANE SOLAR PROJECTS

SUBJECT: 1CCT 115kV TRANSMISSION LINE TANGENT (0 - 2°) FRAMING

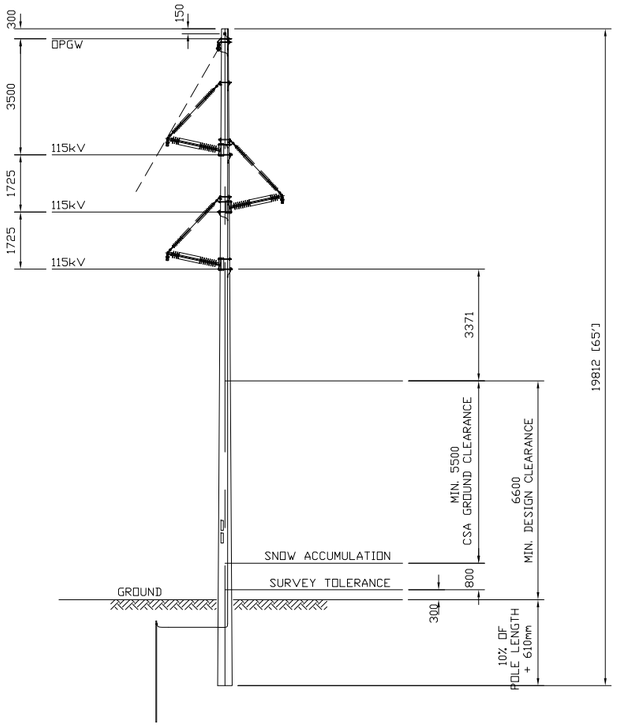
NORTHLAND POWER

Chimax Inc.
Engineering Company
3950 Fourteenth Ave. East, Suite 506
Markham, On., L3R 0A9
Email: chimax@chimax.ca

CLIENT DWG. NO.

DRAWING NO. 1250-P201 | REV. A

CADD FILE ADDRESS 1250-P201-A



1CCT 115kV TRANSMISSION LINE
TANGENT (0 - 2°)
TRIANGULAR CONFIGURATION FRAMING

DESIGN NOTES:

THE PROPOSED STRUCTURE FRAMING, POLE REQUIREMENT AND RECOMMENDATION STANDARD SPAN ARE BASED ON THE FOLLOWING DESIGN DATA:

A. DESIGN CRITERIA

1. METEOROLOGICAL LOCATION:	COCHRANE
2. MINIMUM DESIGN LOADING	
2.1. CSA 22.3 No.1 (LIMIT STATE DESIGN) - CSA HEAVY CONDITION	
HOURLY WIND	400 Pa
RADIAL ICE THICKNESS	12.7 mm (1/2")
CONDUCTOR TEMPERATURE	-20°C
2.2. CSA 22.3 No.60826 (IEC RELIABILITY DESIGN) - 1/50 PERIOD	
(i) IEC ICE (1/50)	17 mm @ -10°C
(ii) IEC WIND (1/50)	80 km/h (302.7 Pa) @ -10°C
(iii) COMBINED ICE (85%) & WIND (60%)	14.5 mm & 109 Pa @ -10°C
WIRE ADJUSTMENT MODELS & MATERIAL FACTORS AS PER CSA 22.3 No. 60826.	

B. CLEARANCE CRITERIA

1. MEAN ANNUAL SNOW ACCUMULATION:	0.8 m
2. ADDITIONAL SURVEY TOLERANCE:	0.3 m
3. VERTICAL GROUND CLEARANCE:	
3.1. MINIMUM CSA 22.3 No.1 VERTICAL GROUND CLEARANCE	
115kV / 138kV CONDUCTOR	5.50 m
3.2. DESIGN VERTICAL GROUND CLEARANCE	
115kV / 138kV CONDUCTOR	6.60 m
4. VERTICAL GROUND CLEARANCE LOADING CONDITIONS	
4.1. PHASE CONDUCTOR	
(i) MAXIMUM CONDUCTOR TEMPERATURE	100°C
(ii) DESIGN CONDUCTOR TEMPERATURE (AS PER IEEE STD. 738)	80°C
(iii) RADIAL ICE THICKNESS (CLEARANCE)	12.7 mm (1/2")
5. PHASE CLEARANCE CONDITIONS:	
(i) HOURLY WIND (NATIONAL BUILDING CODE 1/50)	350 Pa (~86 km/hr)
(ii) HOURLY WIND (NATIONAL BUILDING CODE 1/30)	320 Pa (~82 km/hr)
(iii) GALLOPING	
GALLOPING SWING	290 Pa
GALLOPING ICE	12.7 mm (1/2")

C. WIND POWER PROJECT CIRCUITS DATA

1. MERCHANT CIRCUIT(S)	
1.1. NOMINAL SYSTEM VOLTAGE	124 kV
1.2. NUMBER OF PHASES	3(THREE)
1.3. SYSTEM FREQUENCY	60 Hz
1.4. SYSTEM GROUNDING	LOW IMPEDANCE
1.5. NUMBER OF CIRCUIT	1 (ONE)
1.6. MAXIMUM CIRCUIT CURRENT	270A PER CIRCUIT
1.7. PHASE CONDUCTOR SIZE	477 MCM ACSR (HAWK)
1.8. DESIGN CONDUCTOR TEMPERATURE	80°C

REV	D/M/Y	REVISION	DR	CHK	APP	APP	APP	APP
A	17/08/12	CONCEPTUAL ISSUE	M.H.	E.K.				

ISS	D/M/Y	ISSUED FOR
A	17/08/12	ISSUED FOR REVIEW

REF	NUMBER	REFERENCES

STAMP/SEAL

APPROVED FOR CONSTRUCTION

CLIENT PROJECT MGR. DEPARTMENT MGR. PROJECT MGR.

PROJECT PHASE

PROJECT NO.	ACTIVITY NO.	PACKAGE CODE

SCALE: N.T.S. (11"x17")

	BY	D/M/Y
DSN.	E.KWONG	17/08/12
DRN.	M.HUANG	17/08/12

AREA: NORTHLAND POWER INC. COCHRANE SOLAR PROJECTS

SUBJECT: 1CCT 115kV TRANSMISSION LINE
TANGENT (0 - 2°)
TRIANGULAR CONFIGURATION FRAMING

NORTHLAND POWER

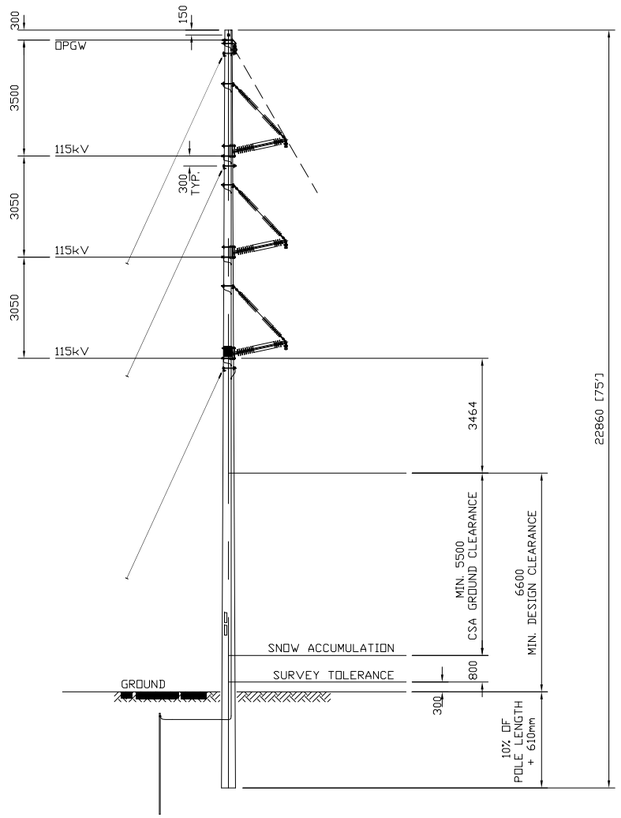
Chimax Inc.
Engineering Company
3950 Fourteenth Ave. East, Suite 506
Markham, On., L3R 0A9
Email: chimax@chimax.ca

CLIENT DWG. NO.

DRAWING NO.: 1250-P201A

REV.: A

CADD FILE ADDRESS: 1250-P201A-A



1CCT 115kV TRANSMISSION LINE
LIGHT ANGLE (2 - 15°) FRAMING

DESIGN NOTES:

THE PROPOSED STRUCTURE FRAMING, POLE REQUIREMENT AND RECOMMENDATION STANDARD SPAN ARE BASED ON THE FOLLOWING DESIGN DATA:

A. DESIGN CRITERIA

1. METEOROLOGICAL LOCATION:	COCHRANE
2. MINIMUM DESIGN LOADING	
2.1. CSA 22.3 No.1 (LIMIT STATE DESIGN) - CSA HEAVY CONDITION	
HOURLY WIND	400 Pa
RADIAL ICE THICKNESS	12.7 mm (1/2")
CONDUCTOR TEMPERATURE	-20°C
2.2. CSA 22.3 No.60826 (IEC RELIABILITY DESIGN) - 1/50 PERIOD	
(i) IEC ICE (1/50)	17 mm @ -10°C
(ii) IEC WIND (1/50)	80 km/h (302.7 Pa) @ -10°C
(iii) COMBINED ICE (85%) & WIND (60%)	14.5 mm & 109 Pa @ -10°C
WIRE ADJUSTMENT MODELS & MATERIAL FACTORS AS PER CSA 22.3 No. 60826.	

B. CLEARANCE CRITERIA

1. MEAN ANNUAL SNOW ACCUMULATION:	0.8 m
2. ADDITIONAL SURVEY TOLERANCE:	0.3 m
3. VERTICAL GROUND CLEARANCE:	
3.1. MINIMUM CSA 22.3 No.1 VERTICAL GROUND CLEARANCE	
115kV / 138kV CONDUCTOR	5.50 m
3.2. DESIGN VERTICAL GROUND CLEARANCE	
115kV / 138kV CONDUCTOR	6.60 m
4. VERTICAL GROUND CLEARANCE LOADING CONDITIONS	
4.1. PHASE CONDUCTOR	
(i) MAXIMUM CONDUCTOR TEMPERATURE	100°C
(ii) DESIGN CONDUCTOR TEMPERATURE (AS PER IEEE STD. 738)	80°C
(iii) RADIAL ICE THICKNESS (CLEARANCE)	12.7 mm (1/2")
5. PHASE CLEARANCE CONDITIONS:	
(i) HOURLY WIND (NATIONAL BUILDING CODE 1/50)	350 Pa (~86 km/hr)
(ii) HOURLY WIND (NATIONAL BUILDING CODE 1/30)	320 Pa (~82 km/hr)
(iii) GALLOPING	
GALLOPING SWING	290 Pa
GALLOPING ICE	12.7 mm (1/2")

C. WIND POWER PROJECT CIRCUITS DATA

1. MERCHANT CIRCUIT(S)	
1.1. NOMINAL SYSTEM VOLTAGE	124 kV
1.2. NUMBER OF PHASES	3(THREE)
1.3. SYSTEM FREQUENCY	60 Hz
1.4. SYSTEM GROUNDING	LOW IMPEDANCE
1.5. NUMBER OF CIRCUIT	1 (ONE)
1.6. MAXIMUM CIRCUIT CURRENT	270A PER CIRCUIT
1.7. PHASE CONDUCTOR SIZE	477 MCM ACSR (HAWK)
1.8. DESIGN CONDUCTOR TEMPERATURE	80°C

REV	D/M/Y	REVISION	J.C.	E.K.				
			DR	CHK	APP	APP	APP	APP
A	16/08/12	CONCEPTUAL ISSUE						

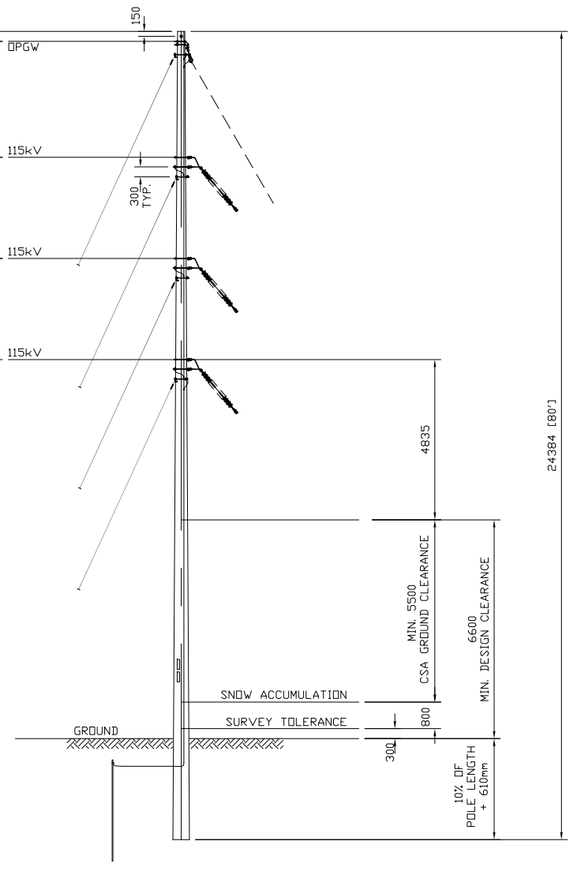
ISS	D/M/Y	ISSUED FOR
A	16/08/12	ISSUED FOR REVIEW

REF	NUMBER	REFERENCES

STAMP/SEAL	APPROVED FOR CONSTRUCTION CLIENT PROJECT MGR. DEPARTMENT MGR. PROJECT MGR.	NORTHLAND POWER
PROPRIETARY INFORMATION: THIS DRAWING IS THE PROPERTY OF CHIMAX INC. AND IS NOT TO BE LOANED OR REPRODUCED IN ANY WAY WITHOUT THE PERMISSION OF CHIMAX INC.	PROJECT PHASE PROJECT NO. / ACTIVITY NO. / PACKAGE CODE SCALE: N.T.S. (11"x17") BY / D/M/Y: DSN. E.KWONG 15/08/12; DRN. J.CHEN 15/08/12	AREA: NORTHLAND POWER INC. COCHRANE SOLAR PROJECTS SUBJECT: 1CCT 115kV TRANSMISSION LINE LIGHT ANGLE (2-15°) FRAMING DRAWING NO.: 1250-P202 REV.: A CADD FILE ADDRESS: 1250-P202-A

Chimax Inc.
Engineering Company
3950 Fourteenth Ave. East, Suite 506
Markham, On., L3R 0A9
Email: chimax@chimax.ca

CLIENT DWG. NO.



1CCT 115kV TRANSMISSION LINE
MEDIUM ANGLE (15 - 30°) FRAMING

DESIGN NOTES:

THE PROPOSED STRUCTURE FRAMING, POLE REQUIREMENT AND RECOMMENDATION STANDARD SPAN ARE BASED ON THE FOLLOWING DESIGN DATA:

A. DESIGN CRITERIA

1. METEOROLOGICAL LOCATION:	COCHRANE
2. MINIMUM DESIGN LOADING	
2.1. CSA 22.3 No.1 (LIMIT STATE DESIGN) - CSA HEAVY CONDITION	
HOURLY WIND	400 Pa
RADIAL ICE THICKNESS	12.7 mm (1/2")
CONDUCTOR TEMPERATURE	-20°C
2.2. CSA 22.3 No.60826 (IEC RELIABILITY DESIGN) - 1/50 PERIOD	
(i) IEC ICE (1/50)	17 mm @ -10°C
(ii) IEC WIND (1/50)	80 km/h (302.7 Pa) @ -10°C
(iii) COMBINED ICE (85%) & WIND (60%)	14.5 mm & 109 Pa @ -10°C

WIRE ADJUSTMENT MODELS & MATERIAL FACTORS AS PER CSA 22.3 No. 60826.

B. CLEARANCE CRITERIA

1. MEAN ANNUAL SNOW ACCUMULATION:	0.8 m
2. ADDITIONAL SURVEY TOLERANCE:	0.3 m
3. VERTICAL GROUND CLEARANCE:	
3.1. MINIMUM CSA 22.3 No.1 VERTICAL GROUND CLEARANCE	
115kV / 138kV CONDUCTOR	5.50 m
3.2. DESIGN VERTICAL GROUND CLEARANCE	
115kV / 138kV CONDUCTOR	6.60 m
4. VERTICAL GROUND CLEARANCE LOADING CONDITIONS	
4.1. PHASE CONDUCTOR	
(i) MAXIMUM CONDUCTOR TEMPERATURE	100°C
(ii) DESIGN CONDUCTOR TEMPERATURE (AS PER IEEE STD. 738)	80°C
(iii) RADIAL ICE THICKNESS (CLEARANCE)	12.7 mm (1/2")
5. PHASE CLEARANCE CONDITIONS:	
(i) HOURLY WIND (NATIONAL BUILDING CODE 1/50)	350 Pa (~86 km/hr)
(ii) HOURLY WIND (NATIONAL BUILDING CODE 1/30)	320 Pa (~82 km/hr)
(iii) GALLOPING	
GALLOPING SWING	290 Pa
GALLOPING ICE	12.7 mm (1/2")

C. WIND POWER PROJECT CIRCUITS DATA

1. MERCHANT CIRCUIT(S)	
1.1. NOMINAL SYSTEM VOLTAGE	124 kV
1.2. NUMBER OF PHASES	3(THREE)
1.3. SYSTEM FREQUENCY	60 Hz
1.4. SYSTEM GROUNDING	LOW IMPEDANCE
1.5. NUMBER OF CIRCUIT	1 (ONE)
1.6. MAXIMUM CIRCUIT CURRENT	270A PER CIRCUIT
1.7. PHASE CONDUCTOR SIZE	477 MCM ACSR (HAWK)
1.8. DESIGN CONDUCTOR TEMPERATURE	80°C

REV	D/M/Y	REVISION	DR	CHK	APP	APP	APP	APP
A	16/08/12	CONCEPTUAL ISSUE	J.C.	E.K.				

ISS	D/M/Y	ISSUED FOR	APP
A	16/08/12	ISSUED FOR REVIEW	

REF	NUMBER	REFERENCES

STAMP/SEAL

APPROVED FOR CONSTRUCTION

CLIENT PROJECT MGR. DEPARTMENT MGR. PROJECT MGR.

PROJECT PHASE

PROJECT NO.	ACTIVITY NO.	PACKAGE CODE

SCALE	BY	D/M/Y
N.T.S. (11"x17")	DSN. E.KWONG	15/08/12
	DRN. J.CHEN	15/08/12

AREA: NORTHLAND POWER INC. COCHRANE SOLAR PROJECTS

SUBJECT: 1CCT 115kV TRANSMISSION LINE
MEDIUM ANGLE (15-30°) FRAMING

NORTHLAND POWER

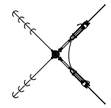
Chimax Inc.
Engineering Company
3950 Fourteenth Ave. East, Suite 506
Markham, On., L3R 0A9
Email: chimax@chimax.ca

CLIENT DWG. NO.

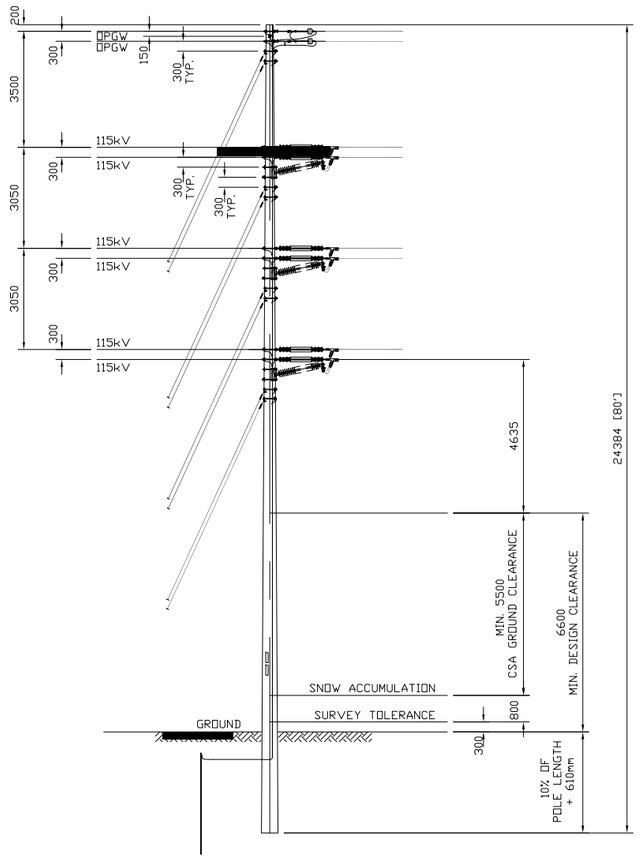
DRAWING NO. 1250-P203

REV. A

CADD FILE ADDRESS
1250-P203-A



PLAN VIEW



1CCT 115kV TRANSMISSION LINE
MEDIUM ANGLE (30 - 60°) DEADEND FRAMING

DESIGN NOTES:

THE PROPOSED STRUCTURE FRAMING, POLE REQUIREMENT AND RECOMMENDATION STANDARD SPAN ARE BASED ON THE FOLLOWING DESIGN DATA:

A. DESIGN CRITERIA

1. METEOROLOGICAL LOCATION:	COCHRANE
2. MINIMUM DESIGN LOADING	
2.1. CSA 22.3 No.1 (LIMIT STATE DESIGN) - CSA HEAVY CONDITION	
HOURLY WIND	400 Pa
RADIAL ICE THICKNESS	12.7 mm (1/2")
CONDUCTOR TEMPERATURE	-20°C
2.2. CSA 22.3 No.60826 (IEC RELIABILITY DESIGN) - 1/50 PERIOD	
(i) IEC ICE (1/50)	17 mm @ -10°C
(ii) IEC WIND (1/50)	80 km/h (302.7 Pa) @ -10°C
(iii) COMBINED ICE (85%) & WIND (60%)	14.5 mm & 109 Pa @ -10°C
WIRE ADJUSTMENT MODELS & MATERIAL FACTORS AS PER CSA 22.3 No. 60826.	

B. CLEARANCE CRITERIA

1. MEAN ANNUAL SNOW ACCUMULATION:	0.8 m
2. ADDITIONAL SURVEY TOLERANCE:	0.3 m
3. VERTICAL GROUND CLEARANCE:	
3.1. MINIMUM CSA 22.3 No.1 VERTICAL GROUND CLEARANCE	
115kV / 138kV CONDUCTOR	5.50 m
3.2. DESIGN VERTICAL GROUND CLEARANCE	
115kV / 138kV CONDUCTOR	6.60 m
4. VERTICAL GROUND CLEARANCE LOADING CONDITIONS	
4.1. PHASE CONDUCTOR	
(i) MAXIMUM CONDUCTOR TEMPERATURE	100°C
(ii) DESIGN CONDUCTOR TEMPERATURE (AS PER IEEE STD. 738)	80°C
(iii) RADIAL ICE THICKNESS (CLEARANCE)	12.7 mm (1/2")
5. PHASE CLEARANCE CONDITIONS:	
(i) HOURLY WIND (NATIONAL BUILDING CODE 1/50)	350 Pa (~86 km/hr)
(ii) HOURLY WIND (NATIONAL BUILDING CODE 1/30)	320 Pa (~82 km/hr)
(iii) GALLOPING	
GALLOPING SWING	290 Pa
GALLOPING ICE	12.7 mm (1/2")

C. WIND POWER PROJECT CIRCUITS DATA

1. MERCHANT CIRCUIT(S)	
1.1. NOMINAL SYSTEM VOLTAGE	124 kV
1.2. NUMBER OF PHASES	3(THREE)
1.3. SYSTEM FREQUENCY	60 Hz
1.4. SYSTEM GROUNDING	LOW IMPEDANCE
1.5. NUMBER OF CIRCUIT	1 (ONE)
1.6. MAXIMUM CIRCUIT CURRENT	270A PER CIRCUIT
1.7. PHASE CONDUCTOR SIZE	477 MCM ACSR (HAWK)
1.8. DESIGN CONDUCTOR TEMPERATURE	80°C

REV	D/M/Y	REVISION	DR	CHK	APP	APP	APP	APP
A	16/08/12	CONCEPTUAL ISSUE	J.C.	E.K.				

ISS	D/M/Y	ISSUED FOR	REF	NUMBER	TITLE
A	16/08/12	ISSUED FOR REVIEW			REFERENCES

STAMP/SEAL

APPROVED FOR CONSTRUCTION

CLIENT PROJECT MGR. DEPARTMENT MGR. PROJECT MGR.

PROJECT PHASE

PROJECT NO.	ACTIVITY NO.	PACKAGE CODE

SCALE: N.T.S. (11"x17")

BY		D/M/Y
DSN.	E.KWONG	15/08/12
DRN.	J.CHEN	15/08/12

AREA: NORTHLAND POWER INC. COCHRANE SOLAR PROJECTS

SUBJECT: 1CCT 115kV TRANSMISSION LINE
MEDIUM ANGLE (30-60°) FRAMING

NORTHLAND POWER

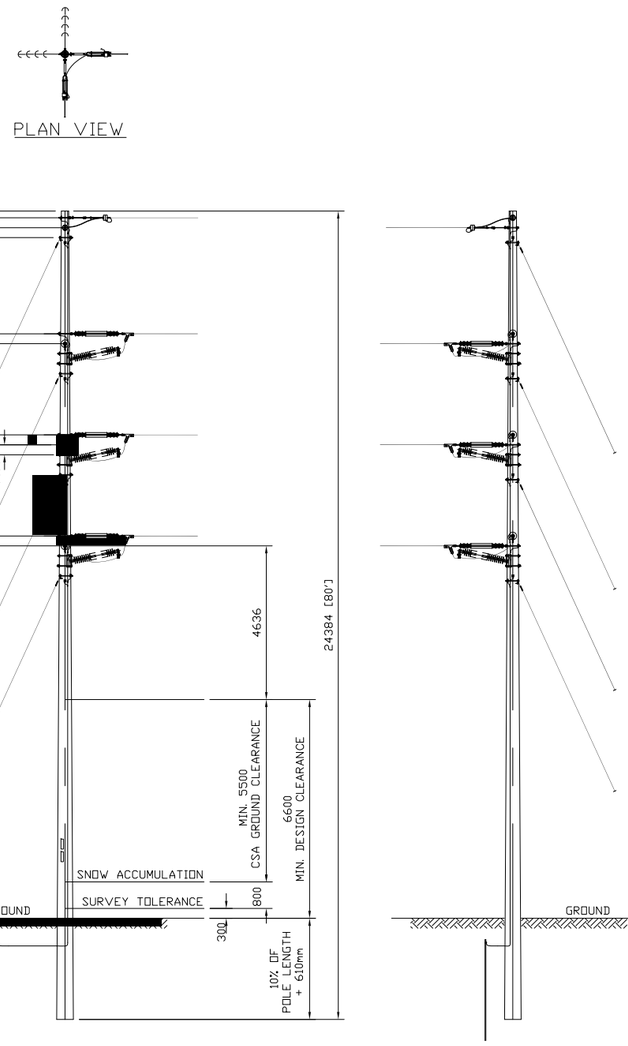
Chimax Inc.
Engineering Company
3950 Fourteenth Ave. East, Suite 506
Markham, On., L3R 0A9
Email: chimax@chimax.ca

CLIENT DWG. NO.

DRAWING NO. 1250-P204

REV. A

CADD FILE ADDRESS 1250-P204-A



1CCT 115kV TRANSMISSION LINE
HEAVY ANGLE (60 - 90°) DEADEND FRAMING

DESIGN NOTES:

THE PROPOSED STRUCTURE FRAMING, POLE REQUIREMENT AND RECOMMENDATION STANDARD SPAN ARE BASED ON THE FOLLOWING DESIGN DATA:

A. DESIGN CRITERIA

1. METEOROLOGICAL LOCATION:	COCHRANE
2. MINIMUM DESIGN LOADING	
2.1. CSA 22.3 No.1 (LIMIT STATE DESIGN) - CSA HEAVY CONDITION	
HOURLY WIND	400 Pa
RADIAL ICE THICKNESS	12.7 mm (1/2")
CONDUCTOR TEMPERATURE	-20°C
2.2. CSA 22.3 No.60826 (IEC RELIABILITY DESIGN) - 1/50 PERIOD	
(i) IEC ICE (1/50)	17 mm @ -10°C
(ii) IEC WIND (1/50)	80 km/h (302.7 Pa) @ -10°C
(iii) COMBINED ICE (85%) & WIND (60%)	14.5 mm & 109 Pa @ -10°C
WIRE ADJUSTMENT MODELS & MATERIAL FACTORS AS PER CSA 22.3 No. 60826.	

B. CLEARANCE CRITERIA

1. MEAN ANNUAL SNOW ACCUMULATION:	0.8 m
2. ADDITIONAL SURVEY TOLERANCE:	0.3 m
3. VERTICAL GROUND CLEARANCE:	
3.1. MINIMUM CSA 22.3 No.1 VERTICAL GROUND CLEARANCE	
115kV / 138kV CONDUCTOR	5.50 m
3.2. DESIGN VERTICAL GROUND CLEARANCE	
115kV / 138kV CONDUCTOR	6.60 m
4. VERTICAL GROUND CLEARANCE LOADING CONDITIONS	
4.1. PHASE CONDUCTOR	
(i) MAXIMUM CONDUCTOR TEMPERATURE	100°C
(ii) DESIGN CONDUCTOR TEMPERATURE (AS PER IEEE STD. 738)	80°C
(iii) RADIAL ICE THICKNESS (CLEARANCE)	12.7 mm (1/2")
5. PHASE CLEARANCE CONDITIONS:	
(i) HOURLY WIND (NATIONAL BUILDING CODE 1/50)	350 Pa (~86 km/hr)
(ii) HOURLY WIND (NATIONAL BUILDING CODE 1/30)	320 Pa (~82 km/hr)
(iii) GALLOPING	
GALLOPING SWING	290 Pa
GALLOPING ICE	12.7 mm (1/2")

C. WIND POWER PROJECT CIRCUITS DATA

1. MERCHANT CIRCUIT(S)	
1.1. NOMINAL SYSTEM VOLTAGE	124 kV
1.2. NUMBER OF PHASES	3(THREE)
1.3. SYSTEM FREQUENCY	60 Hz
1.4. SYSTEM GROUNDING	LOW IMPEDANCE
1.5. NUMBER OF CIRCUIT	1 (ONE)
1.6. MAXIMUM CIRCUIT CURRENT	270A PER CIRCUIT
1.7. PHASE CONDUCTOR SIZE	477 MCM ACSR (HAWK)
1.8. DESIGN CONDUCTOR TEMPERATURE	80°C

REV	D/M/Y	REVISION	DR	CHK	APP	APP	APP	APP
A	16/08/12	CONCEPTUAL ISSUE	J.C.	E.K.				

ISS	D/M/Y	ISSUED FOR	REF	NUMBER	TITLE
A	16/08/12	ISSUED FOR REVIEW			REFERENCES

APPROVED FOR CONSTRUCTION

CLIENT PROJECT MGR. DEPARTMENT MGR. PROJECT MGR.

PROJECT PHASE

PROJECT NO. | ACTIVITY NO. | PACKAGE CODE

SCALE: N.T.S. (11"x17")

	BY	D/M/Y
DSN.	E.KWONG	15/08/12
DRN.	J.CHEN	15/08/12

AREA: NORTHLAND POWER INC. COCHRANE SOLAR PROJECTS

SUBJECT: 1CCT 115kV TRANSMISSION LINE
HEAVY ANGLE (60-90°) DEADEND FRAMING

NORTHLAND POWER

Chimax Inc.
Engineering Company
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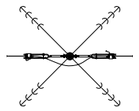
Markham, On., L3R 0A9
Email: chimax@chimax.ca

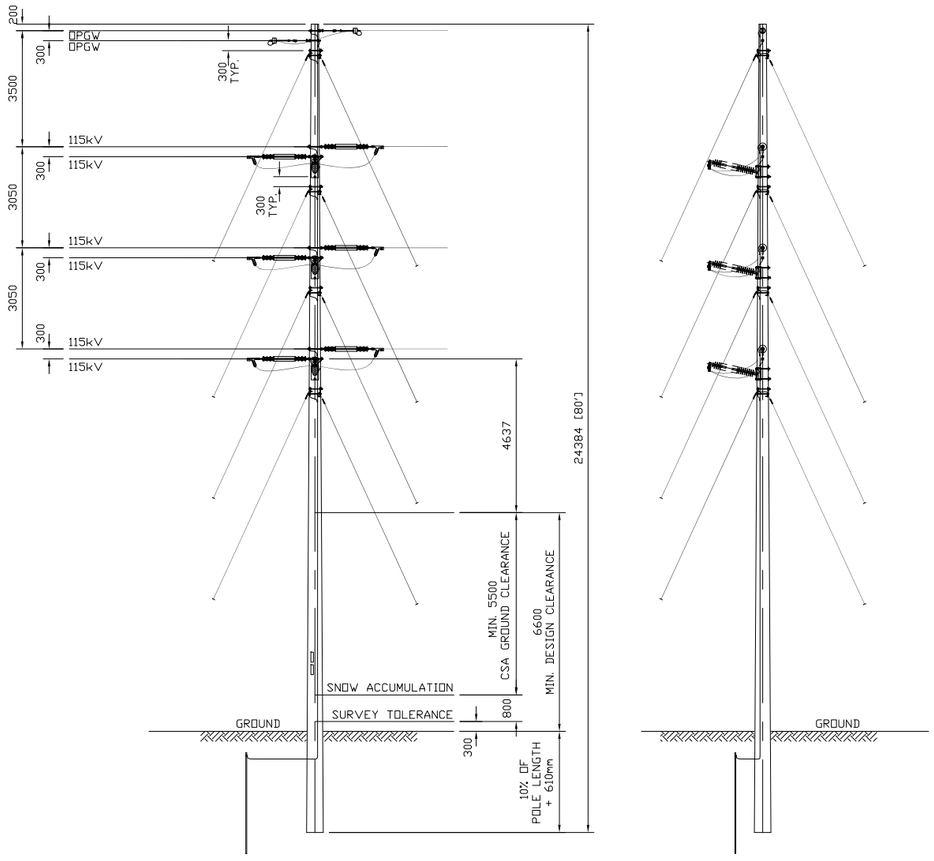
CLIENT DWG. NO.

DRAWING NO.: 1250-P205 | REV.: A

CADD FILE ADDRESS
1250-P205-A



PLAN VIEW



1CCT 115kV TRANSMISSION LINE
DOUBLE DEADEND FRAMING

DESIGN NOTES:

THE PROPOSED STRUCTURE FRAMING, POLE REQUIREMENT AND RECOMMENDATION STANDARD SPAN ARE BASED ON THE FOLLOWING DESIGN DATA:

A. DESIGN CRITERIA

1. METEOROLOGICAL LOCATION:	COCHRANE
2. MINIMUM DESIGN LOADING	
2.1. CSA 22.3 No.1 (LIMIT STATE DESIGN) - CSA HEAVY CONDITION	
HOURLY WIND	400 Pa
RADIAL ICE THICKNESS	12.7 mm (1/2")
CONDUCTOR TEMPERATURE	-20°C
2.2. CSA 22.3 No.60826 (IEC RELIABILITY DESIGN) - 1/50 PERIOD	
(i) IEC ICE (1/50)	17 mm @ -10°C
(ii) IEC WIND (1/50)	80 km/h (302.7 Pa) @ -10°C
(iii) COMBINED ICE (85%) & WIND (60%)	14.5 mm & 109 Pa @ -10°C

WIRE ADJUSTMENT MODELS & MATERIAL FACTORS AS PER CSA 22.3 No. 60826.

B. CLEARANCE CRITERIA

1. MEAN ANNUAL SNOW ACCUMULATION:	0.8 m
2. ADDITIONAL SURVEY TOLERANCE:	0.3 m
3. VERTICAL GROUND CLEARANCE:	
3.1. MINIMUM CSA 22.3 No.1 VERTICAL GROUND CLEARANCE	
115kV / 138kV CONDUCTOR	5.50 m
3.2. DESIGN VERTICAL GROUND CLEARANCE	
115kV / 138kV CONDUCTOR	6.60 m
4. VERTICAL GROUND CLEARANCE LOADING CONDITIONS	
4.1. PHASE CONDUCTOR	
(i) MAXIMUM CONDUCTOR TEMPERATURE	100°C
(ii) DESIGN CONDUCTOR TEMPERATURE (AS PER IEEE STD. 738)	80°C
(iii) RADIAL ICE THICKNESS (CLEARANCE)	12.7 mm (1/2")
5. PHASE CLEARANCE CONDITIONS:	
(i) HOURLY WIND (NATIONAL BUILDING CODE 1/50)	350 Pa (~86 km/hr)
(ii) HOURLY WIND (NATIONAL BUILDING CODE 1/30)	320 Pa (~82 km/hr)
(iii) GALLOPING	
GALLOPING SWING	290 Pa
GALLOPING ICE	12.7 mm (1/2")

C. WIND POWER PROJECT CIRCUITS DATA

1. MERCHANT CIRCUIT(S)	
1.1. NOMINAL SYSTEM VOLTAGE	124 kV
1.2. NUMBER OF PHASES	3 (THREE)
1.3. SYSTEM FREQUENCY	60 Hz
1.4. SYSTEM GROUNDING	LOW IMPEDANCE
1.5. NUMBER OF CIRCUIT	1 (ONE)
1.6. MAXIMUM CIRCUIT CURRENT	270A PER CIRCUIT
1.7. PHASE CONDUCTOR SIZE	477 MCM ACSR (HAWK)
1.8. DESIGN CONDUCTOR TEMPERATURE	80°C

REV	D/M/Y	REVISION	DR	CHK	APP	APP	APP	APP
A	16/08/12	CONCEPTUAL ISSUE	W.H.	E.K.				

ISS	D/M/Y	ISSUED FOR	REF	NUMBER	TITLE
A	16/08/12	ISSUED FOR REVIEW			REFERENCES

APPROVED FOR CONSTRUCTION

CLIENT PROJECT MGR. DEPARTMENT MGR. PROJECT MGR.

PROJECT PHASE

PROJECT NO.	ACTIVITY NO.	PACKAGE CODE

SCALE: N.T.S. (11"x17")

	BY	D/M/Y
DSN.	E.KWONG	16/08/12
DRN.	M.HUANG	16/08/12

AREA: NORTHLAND POWER INC. COCHRANE SOLAR PROJECTS

SUBJECT: 1CCT 115kV TRANSMISSION LINE DOUBLE DEADEND FRAMING

NORTHLAND POWER

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Email: chimax@chimax.ca

CLIENT DWG. NO.

DRAWING NO. 1250-P206 REV. A

CADD FILE ADDRESS 1250-P206-A

PROJECT DETAILS

Right of Way Information

The following diagram, Chimax drawing 1250-P003-A, 115 kV Transmission Line Tangent Structures Conceptual Right of Way Design, provides details with regard to the type of pole structure to be used along the RoWs**.**