



CROWN LAND SURVEY STANDARDS – 2009

Department of Environment and Conservation

Lands Branch

Crown Lands Administration Division

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1. DEFINITIONS

Within the standards:

- (a) "Act" means the *Lands Act*, SNL 1991 Chapter 36 as amended, and its successor legislation;
- (b) all terms defined in the *Lands Act* apply to these standards;
- (c) "Department" means the Department of Environment and Conservation (and its successor Departments of which the Lands Branch is included);
- (d) "Minister" means the Minister of the Department or delegated authority;
- (e) "MTM" means 3 Degree Modified Transverse Mercator Projection;
- (f) "NAD 83" means the North American Datum accepted in 1983;
- (g) "Surveyor" means a member of the Association of Newfoundland Land Surveyors holding a current Certificate of Authorization;
- (h) "Instructions" means survey instructions contained in the Survey Authorization, plus any other instructions deemed necessary by the Minister and;
- (i) "Survey marker" means an iron bar not less than fifteen (15) millimetres in diameter with an attached surveyor's plastic cap as prescribed by the Association of Newfoundland Land Surveyors.

2. SURVEY AUTHORIZATION

- (1) Before commencing a survey under the Act, the surveyor shall request, in writing, authorization from the Minister.
- (2) The request for survey authorization shall include:
 - (a) the applicant's name;
 - (b) the location of the land to be surveyed; and
 - (c) the application number.
- (3) Upon receipt of the request, the Minister may issue an authorization subject to these standards and any other instructions deemed necessary by the Minister. The Minister shall discuss technical aspects of the survey with the surveyor and the applicant only.
- (4) The Minister, in his or her absolute discretion, may refuse to issue a survey authorization to a surveyor for the following reasons:

- (a) A surveyor refuses to cooperate with the Department in resolving Crown title issues associated with the surveyor's Crown land surveys.
- (b) A surveyor demonstrates a consistent lack of due diligence in the performance of his or her duties with respect to Crown land surveys.
- (c) Any other reason the Minister considers to be significant enough to do so.

3. BOUNDARIES

- (1) All boundaries shall be established and defined in accordance with the Association of Newfoundland Land Surveyors' standards, regulations and Manual of Practice.
- (2) **Shape and Size of Lots**
 - (a) Unless otherwise specified, lots shall be surveyed rectangular in shape.
 - (b) Notwithstanding subsection 3(2)(a) the surveyor may encounter field conditions that render the creation of a rectangular lot impractical. In such circumstances the lot may be surveyed as a polygon figure provided prior written or verbal approval has been received from either of the following Departmental officials: Regional Lands Manager, Regional Lands Surveyor, Director of Crown Lands Administration, Manager of Crown Lands Administration or Supervisor of Crown Titles. When such approval is given verbally the Departmental official authorizing the change shall provide the surveyor with written confirmation. This confirmation shall be included as part of the survey submission.
 - (c) Lots shall not be created that prejudice orderly development. Unless otherwise specified, the new lots shall adjoin existing titles or leave sufficient land between existing titles and the lot being created to permit future orderly development.
 - (d) The area of the land being surveyed shall not exceed the area approved in the survey authorization.
 - (e) Notwithstanding subsection 3(2)(d) the approved area for lots less than twenty (20) hectares may be exceeded to include small sections of Crown land between existing lots or natural boundaries and the lot being surveyed provided prior written or verbal approval has been received from a Departmental official as identified in subsection 3(2)(b) When such approval is given verbally, the Departmental official authorizing the change shall provide the surveyor with written confirmation. This confirmation shall be

included as part of the survey submission. The final surveyed lot, including the small section, shall be less than twenty (20) hectares unless previously specified by the Department.

(3) Existing Boundaries

- (a) Where an existing surveyed boundary adjoins all or part of a boundary being surveyed, it shall be retraced by locating or placing a minimum of two (2) undisputed boundary markers. Survey markers shall be set on the retraced line where required.
- (b) The surveyor shall document in the Surveyor's Report procedures used to resolve any inconsistencies between a Crown title and existing field evidence.

(4) Natural Boundaries

- (a) The upland limit of the shoreline reservation of all water bodies shall constitute the boundary of a lot. The said reservation to be maintained is fifteen (15) metres wide unless otherwise specified in the instructions. This applies to both salt and fresh water bodies pursuant to Section 7 of the Act.
- (b) Notwithstanding subsection 3(4)(a), where a lot extends across a water body (including salt water) the metes and bounds description of the lot shall include the water body. However, the bed of the water body and a shoreline reservation having a minimum width of fifteen (15) metres shall be reserved, unless otherwise specified in the instructions.

(5) Existing or Proposed Roads

- (a) Where the limit(s) of a road forms the boundary of a lot being surveyed, the point of intersection of the limit(s) and boundary shall be monumented.
- (b) The centre line of existing roads shall be surveyed and the limits calculated.
- (c) Where an existing road divides a parcel of land, all intersections of the road limits with the lot boundaries shall be monumented and the centre line surveyed.
- (d) Where the limit of a proposed road forms part of the boundary, the limit shall be surveyed.
- (e) Whether a road is existing or proposed, the road shall be described in curve linear format.
- (f) The right-of-way width of a road shall be that stipulated by the Department of Transportation and Works, this Department or the local municipality, whichever has

jurisdiction.

4. SURVEY REFERENCE – POSITIONAL AND AZIMUTHAL

All surveys shall be referenced in accordance with the Association of Newfoundland Land Surveyors' standards, regulations and Manual of Practice.

5. MONUMENTATION

Survey markers as prescribed by the Association of Newfoundland Land Surveyors shall be used to Monument all corners of Crown land surveys.

6. SURVEYOR'S FIELD NOTES

- (1) Surveyors shall make and preserve original field notes while completing Crown land surveys and shall exhibit or provide photocopies to the Department upon request. In the event there are buildings, structures, man-made features, or any evidence of occupation, the surveyor shall provide an additional copy of the survey plan clearly showing the position and identification of all such evidence, drawn to scale.
- (2) When the lands being surveyed are bounded by a shoreline reservation as defined by Section 7 of the Act, all evidence of occupation shall be shown and identified as per subsection 6(1).

7. PLANS

The Survey Plan delineates the perimeter boundary by horizontal surface measurement and identifies the adjoining owners.

(1) Plan Preparation

- (a) Plans shall be prepared on standard white bond paper;
- (b) Plans may vary in size from a minimum of 215 millimetres X 355 millimetres (single lot survey) to a maximum of 800 millimetres X 1150 millimetres. The Department shall determine the size of plans where the minimum size is not used.
- (c) Plans shall be drawn to a professional standard of draughtsmanship.

(2) Scale of Plans

- (a) Plans shall be drawn to a scale that will permit all required details and information to be shown without congestion.

(b) One of the following scales shall be used:

- i) 1:100, 1:125, 1:150, 1:200, 1:250, 1:500, 1:750; or
- ii) multiples of such scales by an integral power of ten (10).

(c) Where practical, a scale of 1:2500 shall be used on special plans.

(d) For clarity, inserts of a larger scale may be used.

(e) The insert referred to in subsection 7(2)(d) shall conform to a scale prescribed in subsection 7(2)(b). Where impractical, "not to scale" shall be noted on the insert.

(3) Survey Plan

(a) The Survey Plan shall be labelled "Schedule B" and shall contain the following:

- (i) north direction indicator;
- (ii) scale;
- (iii) date of survey;
- (iv) application number;
- (v) original stamp and signature of the surveyor, mechanical reproductions shall not be accepted;
- (vi) all existing and created survey evidence (ie: survey markers, cut lines, etc.);
- (vii) where a Crown land survey adjoins a title issued by the Minister, the name of the original title holder for grants, current title holder for leases and the appropriate identifiers only should be indicated;
- (viii) when a Crown land survey adjoins land other than those issued by the Minister, the names of the land owners including the identifying numbers of the parcel shall be shown;
- (ix) on curved boundaries, the arc length, radius, chord bearing and chord distance shall be shown;
- (x) widths shall be shown for all reservations, rights-of-way and easements;
- (xi) all linear dimensions shown on the plan shall be reduced to horizontal ground level and displayed to the nearest millimetre;
- (xii) all directions shown on the plan shall be displayed to the nearest second of arc;
- (xiii) survey reference as outlined in Section 4 shall be plotted on the plan;
- (xiv) area; and
- (xv) legend.

(b) Only the name of the survey company and the surveyor's job reference number may be shown on the survey plan. The company logo, letterhead, address, telephone number or other information shall not be shown.

(4) **Special Plan**

Notwithstanding subsection 7(3)(a), special plans shall also contain:

- (i) title block approved by the Department;
- (ii) location plan;
- (iii) curve data;
- (iv) area of lot or lots; and
- (v) scale.

8. **GLOBAL POSITIONING SYSTEM (GPS) SURVEYS**

(1) **Introduction**

There are a number of GPS survey methods and processing procedures that produce results acceptable for Crown land surveys. These *Crown Land Survey Standards – 2009* focus on surveying practices to be followed when using Real-time Kinematic (RTK) and/or static positioning methods.

(a) **RTK**

- (i) **RTK positioning** - utilizes at least one (1) base station unit and one rover unit.

The base station remains stationary acting as a transmitter broadcasting a correction from an established position to the rover unit. The rover receives this correction permitting coordinate positions to be established on previously uncoordinated points.

- (ii) Technical manuals sometime describe RTK as a topographic surveying method, not intended for boundary surveys. *Crown Land Survey Standards – 2009* using RTK techniques therefore dictate greater observational and occupational redundancies in addition to checks specified by the manufacturers.

- (iii) RTK is not recommended for survey projects with marginal sky visibility, such as in a forest canopy environment. Marginal sky visibility greatly reduces signal strength, leading to loss of lock between the base and rover units. This results in a solution not satisfactory to meet *Crown Land Survey Standards - 2009*.

However, RTK is acceptable if the surveyor takes the necessary precautions and uses procedures resulting in a solution that satisfies *Crown Land Survey Standards - 2009*. Operations under adverse conditions such as a forest canopy may require longer observation times and/or establishment of temporary turning points. It is the responsibility of the surveyor to decide if RTK positioning is the appropriate method.

- (b) **Static positioning** - creates a network of baselines for point positioning. This method utilizes multiple receivers and sessions producing observational redundancies. A least squares adjustment of observations is also required. This method provides higher accuracy than RTK positioning and is primarily used for ties to the provincial grid reference system. Static positioning may be used to establish the property corners of a Crown land survey.
- (c) **Variation from these GPS standards** – shall meet the accuracy standard in accordance with the Association of Newfoundland Surveyors' standards, regulations and Manual of Practice.
- (d) **GPS Survey Report** – constitutes an independent report to accompany other required submissions and shall outline the GPS method used during the performance of a Crown land survey. This report shall describe observational and occupational redundancy methods used to detect blunders and shall also state that the required accuracy of the survey has been achieved.

(2) **Real-Time Kinematic (RTK) Positioning**

(a) **RTK GPS Receiver Requirements**

- (i) Dual frequency carrier phase units are recommended as single frequency units are subject to a baseline length limitation of ten (10) kilometres.
- (ii) RTK equipment shall have the following capabilities:
 - (a) Process kinematic position corrections;
 - (b) Send kinematic position corrections;
 - (c) Receive kinematic position corrections;
 - (d) Log observables;
 - (e) Relevant map projection;

(f) Correct ellipsoidal model and;

(g) Correct geoid model.

(b) Field Procedures for RTK Crown Land Surveys

(i) Base station shall:

(a) Occupy a Provincial/Federal Horizontal Control Survey Marker or a point that has been coordinated to the satisfaction of the Department (**a point coordinated to the satisfaction of the Department shall mean a point referenced to the provincial grid and conforming to the requirements of Section 4 of these *Crown Land Survey Standards – 2009***); or

(b) Occupy an autonomous position while the Rover localizes on a Provincial/Federal Horizontal Control Survey marker or point that has been coordinated to the satisfaction of the Department.

(c) Remain stationary for the duration of the survey.

(ii) The rover unit shall:

(a) Occupy a second Provincial/Federal Horizontal Control Survey Marker, or a point coordinated to the satisfaction of the Department, as positional confirmation. The positional confirmation shall be made immediately after the base station is setup and prior to the base station taken down. (This observational check will verify RTK equipment is working correctly and that the required accuracy is obtained);

(b) Move to unknown points receiving a position correction via data transfer link from the base station.

(iii) A mask angle of ten (10) degrees or greater above the horizon shall be maintained.

(iv) Coordinated point positions shall be recorded and clearly identified.

(v) Property corners established by RTK positioning shall also be verified using one or all of the following methods:

(a) Coordinate positioning from two (2) different base stations;

(b) Independent measurements by conventional survey method; or

- (c) Point reoccupation using the same base station, requiring the rover to have an antenna dump (turn the rover upside down for 10 seconds and then let it lock on to satellites again).
- (d) Tolerance settings in GPS to be set at fix only on 30mm. (This will meet the accuracy requirement as stated in the Association of Newfoundland Land Surveyors Manual of Practice)

(3) Static Positioning

(a) Static GPS Receiver Requirements

Static GPS receivers shall be geodetic grade receivers having the following capabilities:

- (a) Observing carrier phase measurements and;
- (b) Logging data for processing.

(b) Field Procedures for Static Crown Lands Surveys

- (a) The survey shall be referenced directly to the Provincial/Federal Horizontal Control Network, or a point coordinated to the satisfaction of the Department.
- (b) Dual frequency receivers shall be used on baselines longer than twenty (20) kilometres;
- (c) Single frequency receivers may be used on baselines less than twenty (20) kilometres;
- (d) All points shall be measured by two (2) independent baselines to provide sufficient redundancy to perform a least squares adjustment and;
- (e) A mask angle of ten (10) degrees or greater above the horizon shall be maintained.

(4) **Required Accuracy of RTK and Static Methods for Crown Land Surveys**

Both of these methods shall achieve an accuracy that is in compliance with the Association of Newfoundland Land Surveyors' GPS Standards and Guidelines for Legal Surveying, regulations and Manual of Practice.

(5) **Report for Crown Land GPS Surveys**

A GPS observational report shall include the following:

- (i) Method of survey RTK or Static;
- (ii) Make and model of receivers;
- (iii) Make and model of antenna and related equipment;
- (iv) Processing and adjustment software used;
- (v) Written summary of RTK and/or Static operational procedures including system checks, duplicate point occupation and redundancy observations;
- (vi) Mask angle observed;
- (vii) A detailed explanation to the satisfaction of the Department of any problems and/or variations from these standards; and
- (viii) The following is to be submitted to the Department **only upon request**:
 - (a) Diagram(s) indicating the survey configuration with all points clearly identified;
 - (b) Technical procedures including a hard copy of coordinates and a summary of results generated by the GPS software with all points clearly identified;
 - (c) Listing of Provincial/Federal Horizontal control survey markers referenced including the results of checks carried out with these markers;
 - (d) Rinex format data files; and
 - (e) Position Dilution of Position (PDOP) and Geometric Dilution of Precision (GDOP) observed for each point.

9. DESCRIPTION

The description shall contain the following:

- (a) The heading shall read Schedule "A";
- (b) The description shall be typed in block paragraph format;
- (c) The bearings and distances shall be shown in both text and numerical format;
- (d) Easements and rights-of-way shall be identified within the body of the description (see sample descriptions);
- (e) The surveyor's stamp, the date of the survey and the surveyor's signature shall be shown, and mechanical reproductions shall not be shown;
- (f) The application number shall be shown at the lower left corner of the page;
- (g) A notation of the reference meridian and NAD 83 Modified Traverse Mercator projection shall be shown; and
- (h) surveyor's job reference number may be shown directly below the application number.

10. SURVEY SUBMISSION

The survey submission shall consist of the following:

- (a) The surveyor's report, stamped, signed and dated;
- (b) Three (3) copies each of all plans and descriptions, all stamped, signed, and dated;
- (c) A GPS report if applicable and;
- (d) Any additional information required by the Minister.

SURVEYOR'S REPORT

APPLICANT: _____

APPLICATION NO: _____

FILE NO.: _____

- 1. Did you find any evidence of an adverse claim to the land either valid or otherwise?
Yes _____ No _____

If yes, please include a typed report in compliance with Section 11 of the *Lands Act*:

- 2. List names of individuals, who provided information on the land status:

- 3. Were there any inconsistencies between the research documentation and the found field evidence?
Yes _____ No _____
If yes, please include a typed report explaining procedures used to resolve these inconsistencies.

- 4. Have you found any verbal, documentary or physical evidence that may jeopardize the Crown in issuing a lease/grant/easement? Yes _____ No _____
If yes, please include a typed report.

- 5. Have you included an additional plan showing any evidence of occupation?
Yes _____ No _____.

- 6. Are all the boundary lines through wooded areas connecting the corners open and clear?
Yes _____ No _____.
If no, a typed report must be included explaining why not.

Surveyor's Stamp

I hereby certify that these survey returns are in compliance with the *Crown Land Survey Standards - 2009* and that the survey plans and description submitted accurately represent the results of the survey preformed by me on _____ .

NEWFOUNDLAND LAND SURVEYOR

SCHEDULE "A"
(Sample)

All that piece or parcel of land situate and being at Anchor Point, abutted and bounded as follows, that is to say:

Beginning at a survey marker in the northeasterly limit of Subdivision Road, fifteen (15) metres wide, the said point being distant eight hundred ninety decimal zero eight eight (890.088) metres as measured on a bearing of south fifty-eight degrees thirty minutes zero six seconds east (S 58° 30' 06" E) from Control Monument number 88G4066;

Thence running by land granted by the Crown to John Doe and being registered in Volume 250 Folio 470 in the Registry of Crown Titles north thirty-two degrees fifteen minutes forty-seven seconds east (N 32° 15' 47" E) forty-six decimal six seven zero (46.670) metres to a survey marker;

Thence running by Crown land occupied by John Doe north thirty-two degrees fifteen minutes forty-seven seconds east (N 32° 15' 47" E) fifteen decimal three three zero (15.330) metres to a survey marker.

Thence running along the southwesterly limit of a reservation, fifteen (15) metres wide, extending along the southwesterly shoreline of No Name Pond to a survey marker which is distant thirty decimal zero zero zero (30.000) metres as measured on a bearing of south fifty-seven degrees forty-four minutes thirteen seconds east (S 57° 44' 13" E) from the last mentioned survey marker;

Thence running by Crown land occupied by Joe Blow south thirty-two degrees fifteen minutes forty-seven seconds west (S 32° 15' 47" W) sixty-two decimal zero zero zero (62.000) metres to a survey marker;

Thence running by the aforesaid northeasterly limit of Subdivision Road north fifty-seven degrees forty-four minutes thirteen seconds west (N 57° 44' 13" W) thirty decimal zero zero zero (30.000) metres, more or less, to the point of beginning and being more particularly shown and delineated on the attached plan ;

The above described piece or parcel of land contains an area of zero decimal one eight six (0.186) hectares, more or less;

All bearings referenced to the meridian of fifty-six degrees west longitude of the Three Degree Modified Transverse Mercator Projection, Zone 2, NAD 83 for the Province of Newfoundland and Labrador.



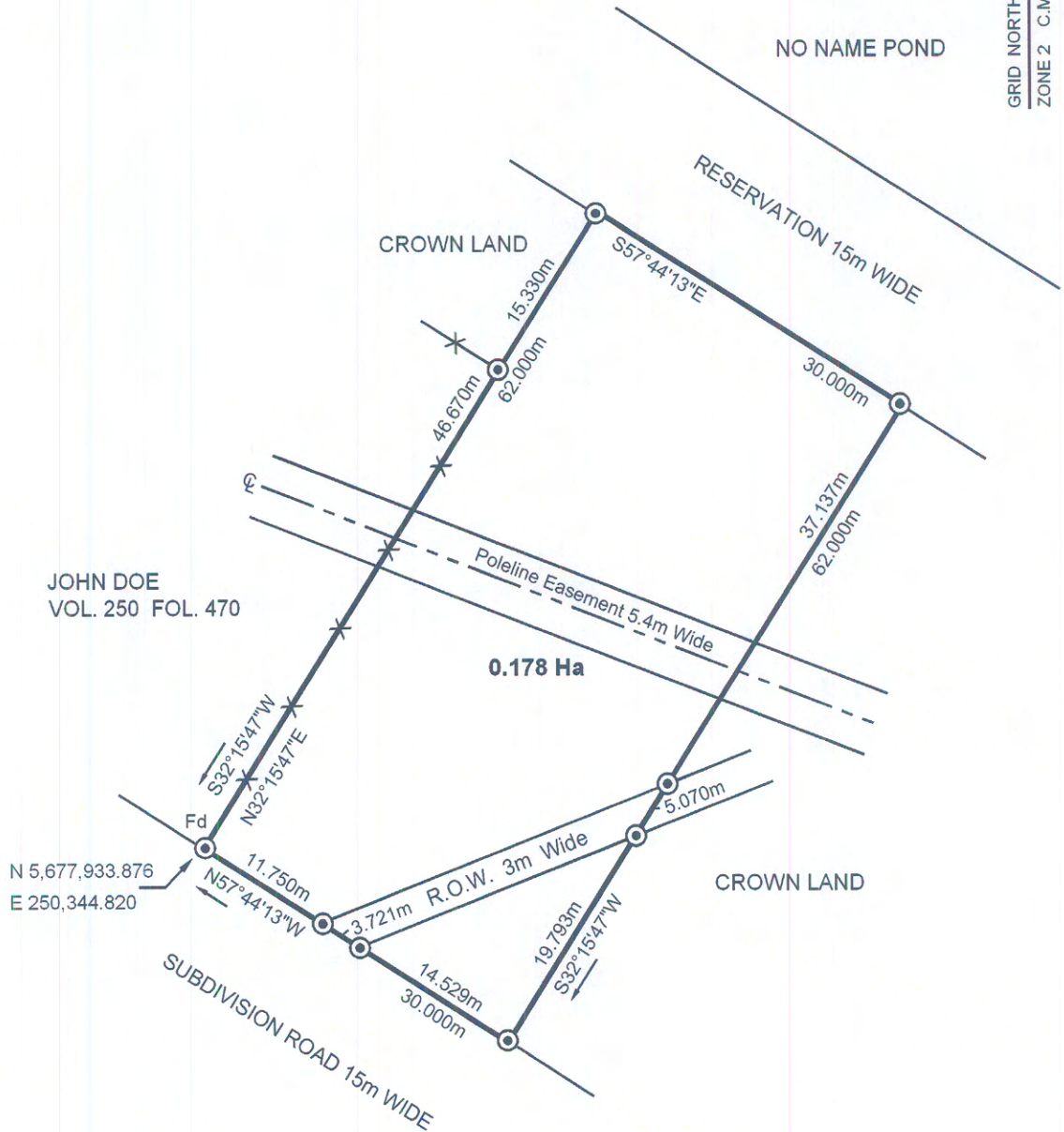
Application No. 100500

December 9, 2008

ANNEX 5

SCHEDULE "B"
(SAMPLE)

GRID NORTH (NAD-83)
ZONE 2 C.M. 56° W.L.



REFERENCE MONUMENTS :

	NORTHING	EASTING
88G4065	5 677 692.666	249 792.489
88G4066	5 678 398.893	249 585.931

SCALE FACTOR = 0.999935

LEGEND :

- ▲ CONTROL MONUMENT
- ⊙ SURVEY MARKER
- IRON PIN
- Fd. FOUND
- * FENCELINE

NOTE : ALL DISTANCES HORIZONTAL GROUND



DATE : DECEMBER 9, 2008
APP. No. 100500

SCALE : 1 : 500

SCHEDULE "A"
(Sample)

All that piece or parcel of land situate and being at Anchor Point, abutted and bounded as follows, that is to say:

Beginning at a survey marker in the northeasterly limit of Subdivision Road, fifteen (15) metres wide, the said point being the westernmost angle of the herein described parcel and having co-ordinates of North 5,677,933.876 metres and East 250,344.820 metres;

Thence running by land granted by the Crown to John Doe and being registered in Volume 250 Folio 470 in the Registry of Crown Titles north thirty-two degrees fifteen minutes forty-seven seconds east (N 32° 15' 47" E) forty-six decimal six seven zero (46.670) metres to a survey marker;

Thence running by Crown land north thirty-two degrees fifteen minutes forty-seven seconds east (N 32° 15' 47" E) fifteen decimal three three zero (15.330) metres to a survey marker;

Thence running along the southwesterly limit of a reservation, fifteen (15) metres wide, extending along the southwesterly shoreline of No Name Pond to a survey marker which is distant thirty decimal zero zero zero (30.000) metres as measured on a bearing of south fifty-seven degrees forty-four minutes thirteen seconds east (S 57° 44' 13" E) from the last mentioned survey marker;

Thence running by Crown land south thirty-two degrees fifteen minutes forty-seven seconds west (S 32° 15' 47" W) thirty-seven decimal one three seven (37.137) metres to a survey marker;

Thence running through a right of way, three (3) metres wide, south thirty-two degrees fifteen minutes forty-seven seconds west (S 32° 15' 47" W) five decimal zero seven zero (5.070) metres to a survey marker;

Thence running by Crown land south thirty-two degrees fifteen minutes forty-seven seconds west (S 32° 15' 47" W) nineteen decimal seven nine three (19.793) metres to a survey marker;

Thence running along the aforesaid northeasterly limit of Subdivision Road north fifty-seven degrees forty-four minutes thirteen seconds west (N 57° 44' 13" W) fourteen decimal five two nine (14.529) metres to a survey marker;

Thence continuing along the aforesaid northeasterly limit of Subdivision Road along the southwesterly extremity of the right of way, north fifty-seven degrees forty-four minutes thirteen seconds west (N 57° 44' 13" W) three decimal seven two one (3.721) metres to a survey marker;

Thence continuing along the aforesaid northeasterly limit of Subdivision Road north fifty-seven degrees forty-four minutes thirteen seconds west (N 57° 44' 13" W) eleven decimal seven five zero (11.750) metres, more or less, to the point of beginning and being more particularly shown and delineated on the attached plan;

The above described piece or parcel of land being subject to a poleline easement, five decimal four (5.4) metres wide, extending through the said land;

Reserving, nevertheless, out of the above described piece or parcel of land, the right of way, three (3) metres wide, extending through the said land;

The above described land contains an area of zero decimal one seven eight (0.178) hectares, more or less;

All bearings referenced to the meridian of fifty-six degrees west longitude of the Three Degree Modified Transverse Mercator Projection, Zone 2, NAD 83 for the Province of Newfoundland and Labrador.



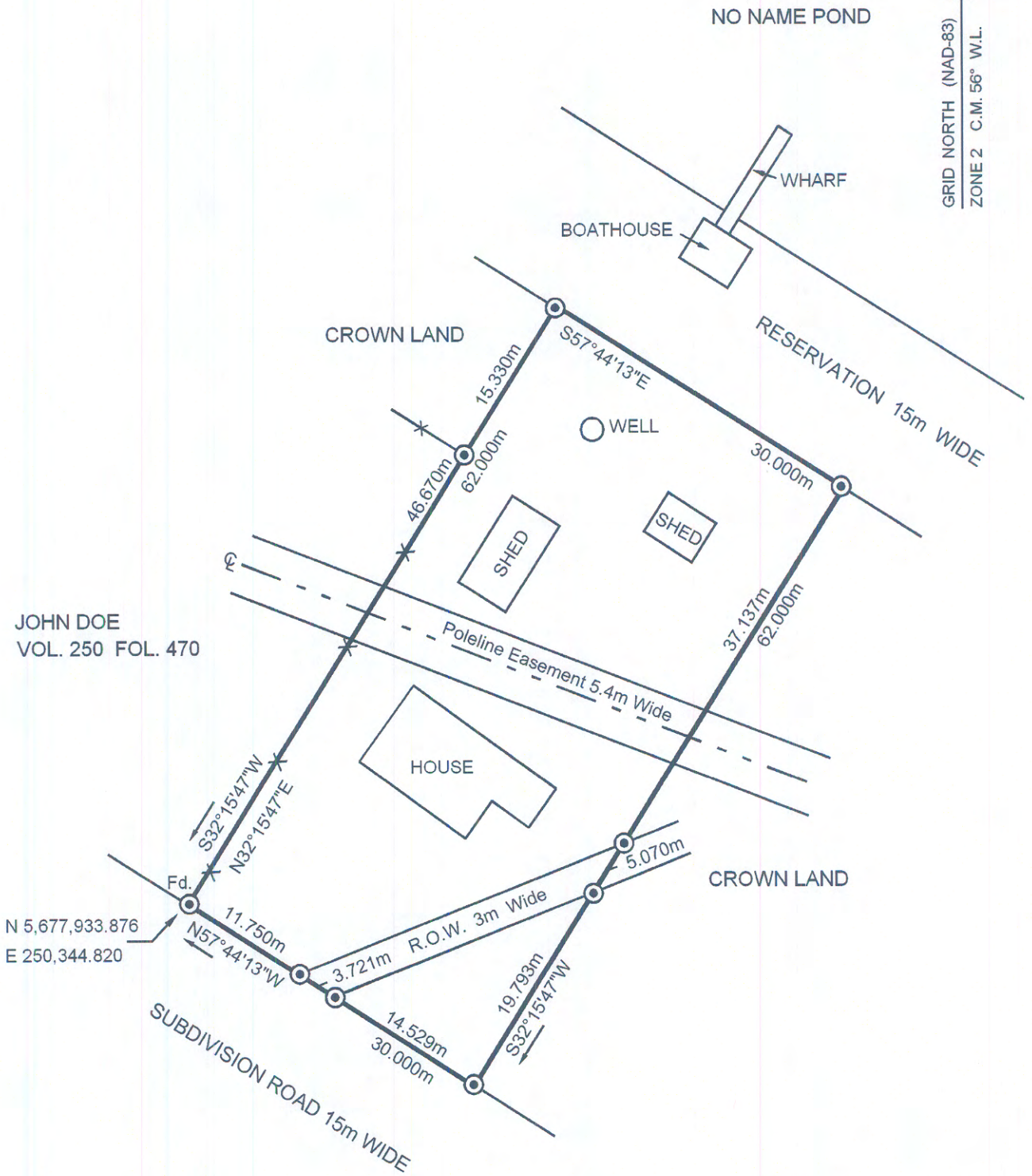
Application No. 100500

December 9, 2008

ANNEX 7

ADDITIONAL PLAN SHOWING EVIDENCE OF OCCUPATION
(SAMPLE)

GRID NORTH (NAD-83)
ZONE 2 C.M. 56° W.L.



JOHN DOE
VOL. 250 FOL. 470

N 5,677,933.876
E 250,344.820

REFERENCE MONUMENTS :

	NORTHING	EASTING
88G4065	5 677 692.666	249 792.489
88G4066	5 678 398.893	249 585.931

SCALE FACTOR = 0.999935

LEGEND :

- ▲ CONTROL MONUMENT
- ⊙ SURVEY MARKER
- IRON PIN
- Fd. FOUND
- * FENCELINE

NOTE : ALL DISTANCES HORIZONTAL GROUND



DATE : DECEMBER 9, 2008
APP. No. 100500

— SCALE : 1 : 500 —

