Government of Alberta

Geo-Referencing Digital Plan Submissions
Frequently Asked Questions

March 31, 2011

Geo-Referencing Requirements for All Plans Submitted to the Land Titles Office and Sustainable Resource Development

Frequently Asked Questions

1. What is the genesis for this requirement?

It has been a requirement to submit CAD files to the Land Titles Office (LTO) for over 10 years and to Sustainable Resource Development (SRD) for 4 years. These files have enabled the mapping bases for the Province to be maintained in a timely and cost-effective manner.

However, most CAD files are not "spatial"; i.e. most often they are based on local or assumed coordinates (for example: [0.0, 0.0] or [10,000.0, 10,000.0]). If correct / absolute or real-world coordinates are not used, the CAD file cannot be viewed in its correct geographic location and requires manual adjustments to translate it to its correct spatial location. This extra processing reduces or diminishes the value of the CAD file. If the CAD file is submitted with at least one point in the file at the correct spatial location, the various approving authorities can view the contents relative to the Provincial mapping base in a more timely fashion.

2. At what date will LTO and SRD refuse to register plans where the CAD file is not geo-referenced in accordance with the new standard?

Starting on **January 1, 2010**, plans submitted for registration at LTO and SRD that are not geo-referenced in accordance with the new standard will not be accepted for registration. **See FAQ 15 for details regarding the grandfathering period.**

3. How will the geo-referencing requirement change the way I draft survey plans for registration at LTO and SRD?

Those plans with the CAD file prepared on a GRID plane will need to comply with the Geo-Referencing requirements:

- One geo-referenced point identified on the plan with symbol and text
- 3TM, UTM or 10TM coordinates for the reference point
- Datum used; either NAD83(Original) or NAD83(CSRS)
- The Combined Factor used to scale ground distances to the mapping plane
- A statement in the legend on the origin of the bearings

For those plans prepared with the CAD file on the GROUND plane:

- In addition to the requirements noted above for CAD files prepared on a GRID plane, the CAD file can be drafted or prepared exactly the way it has been to-date. When it is finished, the CAD file should be translated to the geo-referenced point (coordinates) and then rotated to the appropriate GRID bearing derived from an ASCM or ATS point or according to the bearings derived from GNSS observations.

4. Can I use GROUND distances to prepare my CAD file?

GROUND distances are the governing values pertaining to that survey; these are the annotated values that are shown (and registered) on the plan. This, of course, will not change.

Many surveyors currently prepare their CAD drawings using GROUND distances; less effort will be required by Surveyors if they choose to continue this practice. This new requirement will give surveyors a choice in preparing and submitting their CAD file: GROUND or GRID distances can be used; as long as it is noted in the metadata file.

5. How do I orientate the CAD file and what bearings do I show on the face of the survey plan?

The CAD file must be orientated (rotated) to match the grid bearings derived from either:

- Ties to survey control or
- GNSS observations or
- ATS V4.1 coordinates

The bearings shown on the face of the survey plan and the TIF or PDF image will still be the same bearings that would have been used previously; i.e. oriented using an assumed bearing from another plan or from ties to an Alberta Survey Control Marker (ASCM) or from the Alberta Township System (ATS).

6. How do I show or indicate the bearings and orientation that I am using?

There must be a statement in the Legend indicating the origin of bearings as:

- Grid, derived from GNSS observations, or
- Grid, derived from the line between ASCM____ and ASCM ____, or
- Assumed from Plan _____. If the bearings are assumed from a plan, the corresponding grid bearing must be shown in the legend, or
- Grid derived from published ATS coordinates from _____ to ____. State the ATS points used; for example: NE 1-05-13-4 to E 12-05-13-4

Examples: "Bearings are 3TM NAD83; derived from line between ASCM 1234 and ASCM 3865 and are referred to 114 degree West Longitude."

or

"Bearings are UTM NAD83; derived from GNSS observations at ASCM 3865 and are referred to 117 degree West Longitude."

or

"Bearings are UTM NAD83; derived from ATS V4.1 coordinates from NE 1-05-13-W4 to E 12-05-13-W4."

7. Is there a preference between 3TM or UTM projection for the CAD file?

Use of the 3TM or UTM projection for the CAD file is dependent on whether the survey falls within an Urban Cadastral Map Area or a Rural Cadastral Map Area. Presently LTO plan bearings are referred to 3TM in the case of an Urban Mapping Area, and UTM in the case of a Rural

Mapping Area. To assist in determining which area your survey falls in, please search for Geodetic Control Fact Sheet Mapping Planes in Alberta at srd.alberta.ca.

8. Which Combined Scale Factor (CSF) should we indicate in the CAD file?

The CSF should be derived from one of the following:

i. The preference is to use a CSF for a point in the middle of the survey
ii. For the geo-referenced point indicated in the Legend
iii. Other manner prescribed by the Alberta Land Surveyor

9. What is the difference between NAD83 (Original) and NAD83 (CSRS)?

With satellite positioning, the NAD83 datum has been adjusted to be more accurate. NAD83 (Original) and NAD83(CSRS) are based on the same reference ellipsoid; however, NAD83(Original) is offset approximately 2m from the geo-center. NAD83(CSRS) is an updated, more accurate, three- dimensional realization of the NAD83 reference system taking advantaged of improved GNSS positioning.

10. Can I use NAD83(CSRS) coordinates?

Yes, CSRS is a more accurate determination of the NAD83 datum (see question above).

11. Are all the ASCMs available in either the NAD83(Original) or NAD83(CSRS) datum?

NAD83(Original) coordinates are available for all ASCMs with published coordinates. Coordinates referenced to the NAD83(CSRS) datum are only published for those ASCMs that make up the NAD83(CSRS) subset. To view the CSRS subset, go to Director of Surveys, Geodetic Control Unit at srd.alberta.ca .

12. Why should we use “observed” rather than “published” coordinates?

Published coordinates for survey control markers reflect adjustments (and distortions) that have been applied to the network. Especially through the use of GNSS, modern surveys may be more accurate than the local control network. By using observed coordinates, the true location of the survey is used and any discrepancy with the published coordinates can be investigated and fixed. If you must use published coordinates for the location of the reference point, NAD83(CSRS) coordinates are more accurate, and thus preferable.

13. Will there be changes in the information required for the DIPS or DDIPS / PCS files submitted with an LTO and SRD plan?

Yes, minor changes will be made to both the DIPS and DDIPS / PCS web application to reflect the geo-referencing requirements. If the appropriate web-based application is not used, the plan will be rejected.

14. Can other practitioners acquire the CAD files submitted to LTO and SRD?

No, the CAD files are used only by LTO, SRD and SDW / AltaLis and only for the purpose for which they were submitted, i.e. the approval and registration process and for mapping the new survey. They are not released or available to any other party.

15. My concern is the fact that there are many surveys that have been completed prior to this Jan 1, 2010 date that have not been submitted to public lands or land titles and consequently may have not been geo-referenced according to the definition of geo-referencing.

Does this in fact mean that more work would have to be done on these plans and associated surveys in order to comply with the new initiative?

Will there be any allowance for grandfathering with respect to the Geo-Referencing Requirements and deadline?

In response to this concern, a twelve month grandfathering period will be provided as follows.

- Plans showing surveys that have been completed on or after January 1, 2010 will have to be geo-referenced following this standard.
- LTO - Plans showing surveys that have been completed prior to January 1, 2010 will not have to be geo-referenced following this standard if they are submitted to Land Titles prior to January 1, 2011.
- SRD - Plans showing public lands surveys that have been completed prior to January 1, 2010 will **not** have to be geo-referenced following this standard, if they are submitted to SRD prior to January 1, 2011. However, these plan **will** have to be geo-referenced following the existing standard (i.e., geo-referenced to ATS version 4.1 - March 2005).
- All plans, regardless of survey dates, submitted to LTO and SRD on or after January 1, 2011 will have to be geo-referenced meeting this new standard.

16. Do I have to have my CAD line work exactly match the distances shown on the body of my plan?

The CAD file should accurately represent the plan of survey and be to scale. In the future, plans of survey (including the CAD file) that are not accurate may be rejected prior to registration. As government, clients and surveyors automate more and more functions it will be important to have accurate linework in the CAD file.

17. I think the Geo-Referencing initiative is a good one. However I am not quite sure what you mean by Geo-referencing. A great deal of our recent plans are prepared with GPS, but it was based on an autonomous solution for our base station. We draft our plans in NAD 83 coordinates, but the accuracy may be no better than 5 meters. Are these plans geo-referenced?

Yes, your autonomous solutions have met the minimum standard. However, it is preferred in this case that you enhance your positions by geo-referencing with PPP. Going this extra step provides

an excellent form of blunder detection and redundancy check. The geo-referencing requirements are broadminded. They range from GNSS surveys tied to survey control, referencing using PPP, or independent GPS positioning. Non-GNSS surveys such as descriptive plans and conventional surveys can be related to ATS version 4.1.

18. If the requirement for Geo referencing is a tie to an ASCM or even a tie through other plans, this policy will greatly increase the work required to register dormant plans. For many companies it will be impossible to register or submit to SRD all the dormant plans and still remain solvent as a company.

The current geo-referencing requirement does not require surveys be integrated, but the goals is to move to integrating all surveys in the next few years. Work is proceeding with the ALSA Standards Committee to determine what the detailed standards will be. In a similar light, the CAPP Geomatics Committee supports in principle surveyor's submitting their final PLA plans directly to SRD, which will also help to address the unfinished survey plan issue. Details will be provided in early 2010.

19. Do descriptive plans have to be geo-referenced? Would you explain to me how we are to show bearings on a Descriptive plan as the concept of those plans is to replace the metes/bounds descriptions without reference to surveying data.

Yes, descriptive plans submitted to LTO have to be geo-referenced. The RP information should be shown on the body of the plan and in the CAD file as is outlined in this document. The tie will be via the ATS v4.1 by using a coordinate from the ATS file. Surveyors can get the ATS file from AltaLis via altalis.com. This is similar to how SRD sketch plans have been and continues to be geo-referenced.

20. The document states that 3TM or UTM coordinates for the reference point must be shown on the plan and recorded in the DIPS and DDIPS / PCS applications. Some of our clients have requested that plans be prepared in 10TM because this projection is compatible with their existing base mapping.

Will 10TM geo-referencing also be acceptable? The vast majority of these plans are Crown disposition plans, not Land Titles plans, and we have been submitting them in 10TM for several years.

This was an oversight as both LTO and SRD accept 10TM plans. The standard has been updated to reflect this.

21. Item 12 in Frequently Asked Questions discusses a preference for observed rather than published coordinates. However, I do not see a requirement for observed coordinates in Geo-Referencing Requirements for Plans of Survey. Sometimes, particularly for legal surveys where we are integrating the survey with ASCMs anyway, it is convenient to use published NAD83(Original) or NAD83(CSRS) coordinates.

Is the use of observed coordinates mandatory?

No, it is not mandatory to use observed coordinates. As stated in FAQ 12, it is preferred in situations where GNSS observations may be better than the local ASCMs. Rural situations where

the local control is derived via Inertial Survey System (ISS) positioning, for example, should be treated differently from urban areas where the control is well integrated and more consistent with GNSS observations. It is left up to the surveyor to decide whether to use published or derived coordinates. A key point when using published values is to use the more accurate coordinates from the ASCM NAD83(CSRS) subset.

22. Why does the geo-referencing symbol and RP text have to show up on the TIFF image/plot file plans we send to LTO? This I assume it will show up on the registered plans that we order. This is really a digital mapping item and once it is in parcel mapping, it is currently, of no use to me as a Land Surveyor.

Showing the symbol and text on the plan of public record provides users additional information regarding geo-referencing. Surveyors will be able to use this information to determine, for example, what ground points on a GPS survey were used to establish a grid bearing. The information could also be used to support re-establishment of a lost monument. The symbol and PR text **must** be shown on plot / pdf files and the CAD file submitted to LTO and SRD.

23. I applaud the efforts of the Digital Submissions Review Committee. The initiative to provide standards for georeferencing of the digital plans is long overdue. On that matter I have a comment and a question:

I have been using the Natural Resources Canada Precise Point Positioning (PPP) Service with excellent results to determine NAD83 CSRS positions for reference points in my work, including ATS section corners and ASCMs that are not part of the provincial NAD83 CSRS subset. The answer to question 12 of the FAQ in the georeferencing specifications document suggests that my 'observed' NAD83 CSRS coordinates would be preferred to the published NAD83 (Original). My most recent submissions have used the NAD83 CSRS (epoch 2002.0) realization to be consistent with Alberta provincial control.

Is this an acceptable practice for the purposes of the initiative?

Yes, for the purposes of geo-referencing, PPP is one of the methods to employ. The geo-referencing standards are as generic as possible, but the PPP solution does fit under GNSS observations. The use of PPP is a preferred method simply because it brings the user into one of the two acceptable geo-referencing datums directly.

Yes, NAD83(CSRS) is the more preferred datum of the two accepted. In some respects, FAQ #12 is directed at situations where a user may desire to use ISS-derived (NAD83[Original]) coordinate values which may or may not be compatible. The ISS is most likely better than the ATS file, but we can get better by going to NAD83(CSRS), and do it with little extra work via PPP.

24. Point 1 refers to information that must be shown in the legend/body of the plan. Is it at our discretion whether we display this information in the legend or in the body of the plan?

As outlined in the geo-referencing FAQs document (available on SPIN) the prescribed symbol and unique text identifier (PR) **must** be shown in the body of the plan (plot /pdf file) and the CAD file and the other information (central meridian, mapping projection, bearing reference, etc.) may be shown in the Legend (see sample plan).

25. There is some confusion on our part as to whether this info needs to be included on the plot file AND/OR the cad file submitted. For example, is the grid reference point to be displayed on the plot file submitted or just the CAD file on layer 35?

This information **must** be shown on both the plot / pdf file and the CAD file.

26. In regards to observed vs published coordinates, how does this affect integration?

Are we no longer required to adjust our plans to published coordinates to facilitate the integration efforts?

Typically the use of published vs observed coordinates becomes an issue in rural areas where surveyors may only have access to ISS integrated ASCMs for local control ties. In urban areas it is recommended to use the existing control and to follow existing methodologies in situations where integration is currently required. However, in rural areas where the quality of ASCMs may be low, then it is recommended to use the observed values. This issue is addressed in FAQ #12 which recommends the use of published coordinates for those ASCMs within the ASCM NAD83(CSRS) subset.

27. We have begun preparing all our plans in grid coordinates for some time now. Do we still require a grid reference point when all points are at grid coordinates?

Yes, surveyors are required to identify a reference point within the plan/CAD file even though the work is on the grid.

28. Our first comment regarding the problem trying to be solved is in response to the City of Edmonton's difficulty in deciphering CAD files and how they are georeferenced. We have submitted plans to the City of Edmonton the same way for many years now, and not once have we had a question regarding any difficulty in how our plans were georeferenced.

I believe part of the problem may be that they are using the CAD file that is submitted as part of the final endorsement submission, and not the LTO submitted plan. The plan for final endorsement is usually identical, except it is not LTO layered, and there may be small clerical revision from a land titles rejection.

If the City of Edmonton was using the LTO submitted plan then the metadata is provided as part of DIPS, including the mapping plane, whether it was tied to control, and the combined factor. This indicates to us that the City of Edmonton is not using or not being supplied with the information when digitally submitting to LTO, or they are using the previously submitted CAD file at the time of final endorsement. This is a concern, since the correct plan is the one to LTO in all cases, since it is the most current prior to registration. **For delayed monumentation plans, it is already required to attach a coordinate file when submitted the plan to LTO, so what better georeferencing is needed?** This file contains all the necessary GRID control information as well as the coordinates for all placed monuments.

The City of Edmonton is using plans received from LTO in their mapping process. Their experience is that the associated metadata received with LTO plans cannot be relied upon.

29. If the intent of these specifications is to submit georeferenced CAD files, then eliminate the section on preparing the plans in ground. We believe this is going to cause more confusion in that the GROUND file is only partially georeferenced now. The specifications indicate to translate the CAD file to the reference position and rotate to a GRID bearing. However, the other step is to scale by the combined factor, so why not just do this then the only option is to submit a georeferenced GRID file. As far as the geo-referenced point identified on the plan with the symbol and text, this should be deleted from the requirements as well. The only purpose of the reference point is to be able integrate the plan with existing GIS systems, and serves no purposes to another Alberta Land Surveyor. Why even show the reference point on the printed plan, place it on a frozen or no plot layer for land titles, and have it entirely in the CAD file.

Another reason to remove this requirement is that the specifications for the reference point look identical to a witness monument, with a circle around an iron post. This is not acceptable, and could potentially cause confusion. If this is eliminated and only included in the CAD file since it serves no purposes on the TIF or PDF file, then this would not be a concern.

The geo-referencing initiative was purposely minimized to reduce the impact on land surveyors. It is a minimum standard and surveyors are encouraged to enhance the standard, including scaling the file to grid.

See FAQ 22, 24 and 25 regarding the benefits and mandatory requirement of showing the point identifier symbol and text on the plan.

30. FAQ 4 is very misleading, particularly the second paragraph indicating that "This new requirement will give surveyors the choice in preparing and submitting their CAD file: GROUND or GRID distances can be used; as long as it is noted in the DIPS metadata file."

This is not correct, since GROUND distances should always be used, but GROUND coordinates can be submitted still. However, as per our comments for requirement #3, this option should be removed, and have all plans be submitted in a georeferenced GRID mapping plan, showing GROUND dimensions on the printed plan.

The option of using ground distances in the CAD files minimizes the impact on surveyors who are not familiar with the conversion process.

31. The requirement in the specifications to rotate the CAD file to match GRID bearings derived from survey control, GNSS or ATS has some concern. In integrated survey areas this is not an issue because of local ASCM, but for areas with little or no control information, the current requirements to integrate a plan of survey are when two or more monuments are each within one kilometer of any two ASCM. I realize that with GNSS, this distance is usually pushed further without a problem and done as a courtesy by an Alberta Land Surveyor.

However, what happens in the case of descriptive plans, or conventionally surveyed plans?

Does a descriptive plan require being georeferenced?

How do I integrate a conventionally surveyed plan with no control other than using ATS, provided it is required to make ties to section evidence for this?

There are no specifications in this document regarding the accuracy of the georeferencing to begin with?

Does it have to meet ASCM integration requirements?

Can you integrate to local control from another surveyor?

Can you integrate with long static baselines from a permanent GNSS station in Calgary for a survey in Fort McMurray?

Can you derive a position from a handheld GPS unit for a conventional survey? In the end, when the plan is submitted to LTO or SRD, the plan will be approved for content and then "best-fit" or "rubber sheeted" into the mapping system anyways, regardless of what the georeferencing of the plan is.

The geo-referencing initiative is not related to and does not effect the integration requirements found in the Manual of Standard Practice (MSP). Geo-referencing descriptive or conventional surveys can be accomplished, for example, by using version 4.1 (March 2005) ATS file, which is the reference frame used for geo-referencing SRD disposition sketch plans. The accuracy of your geo-referenced CAD file is related to the accuracy of your survey, which follows the accuracy requirements found in the MSP.

32. The FAQ 8 requirement should be deleted from the document. If subsection iii indicates that the CSF can be derived by other manners prescribed by the Alberta Land Surveyor, then why even have this section. This factor can be chosen by a number of methods, and should be up to the Alberta Land Surveyor in all cases, so this should be deleted from the requirements.

This FAQ is provided as information.

33. The FAQ 12 section is very unclear, since it refers to modern surveys being more accurate than the local control network. We do agree with this statement; however the accuracy of observed positions is only as accurate as its starting point, which has to start from a published coordinate.

Integration requirements for survey plans as per section 7.1.2 of the MSP indicate that "Integration with survey control means obtaining sufficient measurements from ASCMs into the survey to permit the derivation of grid bearings and the computation of a closure starting at an ASCM and proceeding along the shortest path through the survey to another ASCM." This means that an ASCM derived from ISS can be used as a starting point in order to meet the integration requirements.

If the ASCM is sufficient enough to integrate a survey, then it should be more than adequate for mapping. The specifications indicate that if published coordinates have to be used, then NAD83(CSRS) are preferred. This is not an option in most cases since the NAD83(CSRS) ASCM subset is only a portion of the total number of provincial control, it is absolutely not feasible to georeference to these for all surveys.

This FAQ is provided as information.

34. How is the complete adoption of NAD83(CSRS) and the new height modernization going to be handled? I sat through [the Geodetic Control Unit's] presentation through AGG about a year ago of the height modernization, and this will be happening in the next couple of years I believe, and I am dreading the day this does happen. I think it is completely necessary to do so,

but with every construction company, engineering firm, and utility company, etc. owning GPS systems, I think this is going to be a huge challenge and difficulty to implement.

There are a ton of these "construction surveyors" that don't know much more about these units than just turning it on and following the arrows. **We have a hard time trying to get our own internal engineering group to understand map projections in general, let alone trying to explain the difference reference system of NAD83(CSRS) and why there is a 15 cm shift in their base plan, or else why our elevations have now magically changed by 25 cm to make it fit better across Alberta or Canada?** I can see the looks of confusion and liability claims now.

Similar to the process used to implement previous horizontal datum changes (i.e., NAD27 to NAD83 (original)) we will be communicating the changes and reviewing the impacts for implementation of a new vertical datum. We anticipate working closely with the ALSA Standards Committee to answer these questions. The geo-referencing initiative is one of several steps leading to full integration of all surveys to a single reference framework, which is a goal of the Director of Surveys office. Every effort has been made to minimize the impact on land surveyors and your support to meet the January 1, 2010 implementation date is appreciated.

35. Do you have a sample plan for reference?

Yes, a sample plan has been prepared and attached to this document.