

Re-Markable Roads: When is a Street Fix Fixed?

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ABSTRACT

The original town burghers were keen to formalise the road and street networks of their towns. Hence the introduction of kerb lines via alignment surveys. Alignment gave way to marking street boundaries and placing reference marks: the first being buried concrete blocks, followed 40 years later by pairs of drill hole and wing in concrete kerb and gutter. Subsequently, wholesale loss of these road and street reference marks has led finally to talk of the preservation of those that remained and what to do about the re-marking of existing road boundaries. In a local government area like City of Ryde, where re-development and renewal are rampant, continuing with traditional marking methods may be short-sighted and may have no long-lasting benefits. This paper proposes some policies and examines what City of Ryde is currently doing. The aim of this paper is to garner real support from the surveying industry to assist local government in reclaiming the streets. What happens next is up to you?

KEYWORDS: Re-marking, roads, corners, surveying.

1 INTRODUCTION

The first land grants in Ryde, from 1792, all fronted the Parramatta River in a classic rectangular boundary pattern running north-south (Figure 1). River transport was the focus.

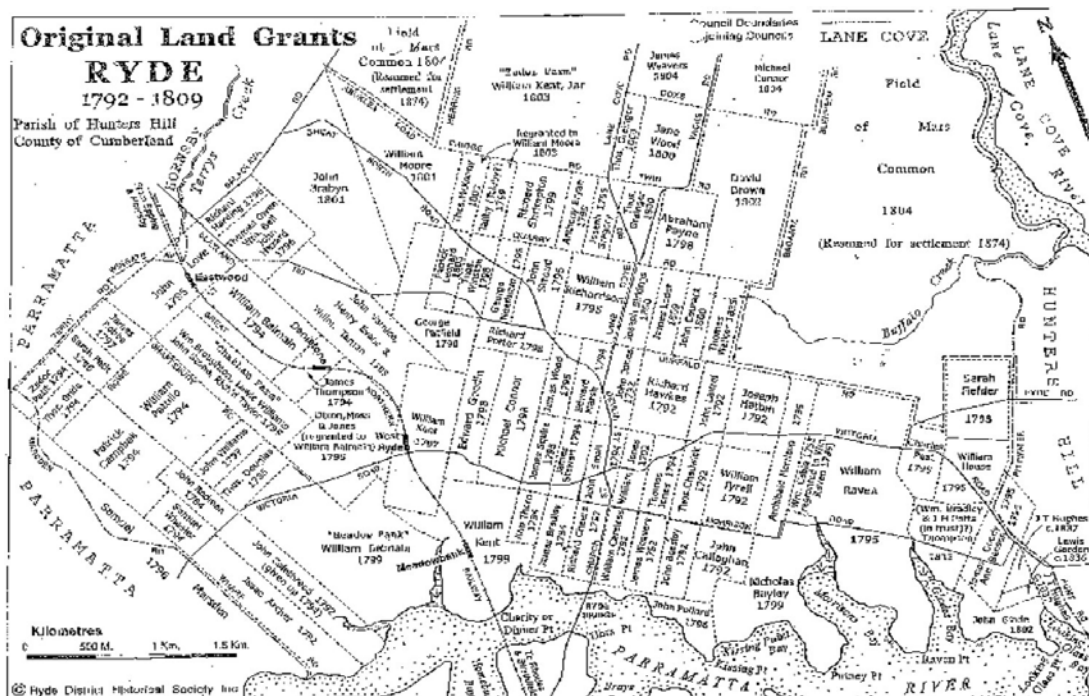


Figure 1: Map of original land grants at Ryde 1792-1809.

During the course of the next 80 years, the main road traversing Ryde ran northwest from the Bedlam ferry wharf at Gladesville to the wharf at Melrose Park. This road did not follow the original road reservations designated in the Crown grants. Many of the colony's early roads became so irregular and poorly defined that the practice of alignment began, i.e. the accurate re-surveying of road boundaries and the leaving of substantial and promisingly long-lasting marks from which to redefine and re-mark road boundaries. Mr Surveyor George Hedgeland's road alignment surveys in Ryde during the 1870s were undertaken to regularise and formalise the boundaries of the existing roads being used. The alignment surveys were actually surveys to re-define streets and roads which were already in use and as such were re-marking the roads. Now, by 2015, the City of Ryde has 845 roads, and except for a handful of RMS-controlled major roads, all are owned and administered by the Council for the City of Ryde (Figure 2).



Figure 2: Map showing the current road layout of Ryde.

2 WHAT DOES A ROAD BOUNDARY MEAN FOR THE SURVEYOR?

Road boundaries have played *the* major role in the integrity of the New South Wales cadastre. Surveyors are taught to determine the road boundary, then to establish the side boundaries of parcels of land and then to redefine the land or to subdivide the land or to create easements etc. This raises the question: If the road boundaries are so important to the cadastre, then how

accurate are they? In answer to that we should know when modern-day survey accuracy was first achieved. The theodolite was the predominant instrument after 1872. Clause 5 of the Regulations for the Employment of Licenced Surveyors issued by the Surveyor General's Department in 1872 reads as follows: "The use of the circumferentor is prohibited..." (Marshall, 2002, p. 30). By 1882, steel ribbands were the current instruments in use for linear measurement. It would seem most reasonable to say that surveys were sound as to measurement by 1885, which means that roads created after 1885 should be reliable as to survey. These days what remains after the surveyors depart from the site are boundary marks, reference marks and plans on public record. Note that surveyors are taught to place their cadastral reference marks not on private land, but within the road reservation.

3 HOW AND WHY DOES A ROAD BOUNDARY CHANGE?

Roads are created during the subdivision process, and if surveyors leave sound reference marks there should be no trouble in defining and marking roads in future surveys. So, why do road boundaries shift in definition? By working through the following example we may be closer to an answer. Figure 3 shows the modern day subdivision pattern of six streets in West Ryde. The land was part of a 1799 land grant of 220 acres to William Balmain. The first roads were created in 1881 by DP611, followed in 1883 by DP1095 and DP1257. These three surveys were all carried out by the same surveyor. (It is interesting that these surveys were each completed prior to 1885). 40 years later, in 1921 and 1923, DP611 was totally re-subdivided over three plans by the one surveyor, and three roads were created: Hay, Bennett and Moss Streets. The original road and lot boundaries in DP611 were made at right angles and parallel to Adelaide Street. The re-subdivision of DP611 in the 1920s created three roads parallel to the southern boundary of DP611, which then displayed a swing of 5'45" when compared to Adelaide Street. This southern boundary was defined by the surveyor adopting a line of fencing occupation. The new roads are all in excess of 460 m in length, so minutes count. The side boundaries of the lots created in the re-subdivision were all made parallel to Adelaide Street.

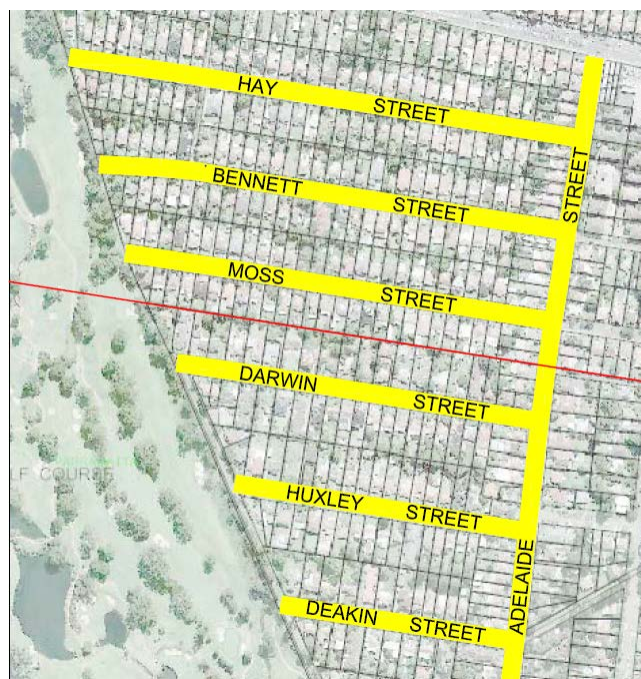


Figure 3: Map showing the road layout of West Ryde in the discussion area.

The three roads south of DP611 (i.e. Darwin, Huxley and Deakin Streets) were created by DP1095 in 1883. Each road was set out parallel to the southern boundary of DP611 and lot boundaries were all created parallel to each other, but at a random angle to the streets.

The first hiccups occurred 40 and 50 years later, with the onset of re-subdivision, when Darwin, Huxley and Deakin Streets were re-fixed parallel to each other but 10 minutes different to the bearing of the southern boundary of DP611. The definition relied on fencing occupation only (Figure 4) and no reference marks were placed until 1939.



Figure 4: Defining evidence: Corner nail and face of a very old fence.

Since then a constant stream of surveyors has visited this area, undertaken surveys and left their reference marks. Today the road bearings, as currently fixed, are shown in Figure 5. Whatever happened to their parallelism? Darwin Street, now, is even shown with variable width!

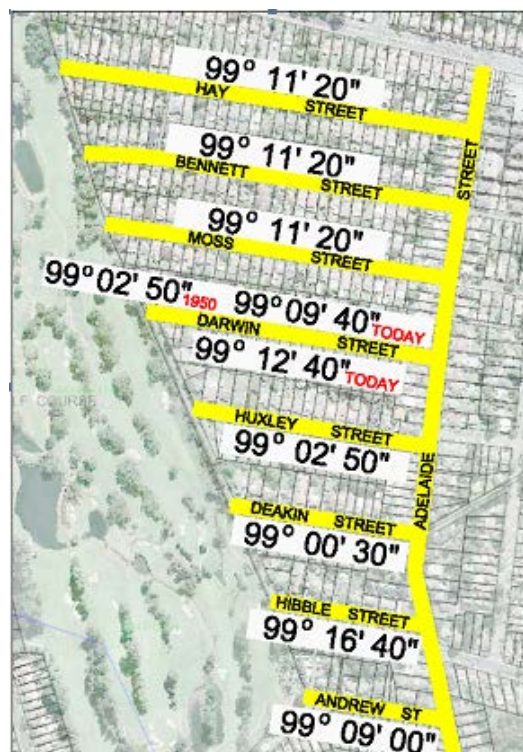


Figure 5: Map showing the current road bearings

Figure 6 illustrates the road layout and subdivision pattern, showing surveying activity. The area shaded yellow comprises the subdivision lots from the original surveys, the area shaded orange comprises plans by compilation on the original lots, and the area shaded pink comprises plans of survey after the original subdivision. Of the original surveys that created these roads and subdivision only one, DP12291 (1923), placed road reference marks: two concrete blocks at the western end of Hay Street. The westernmost concrete block has survived and is still in place today. Since 1924, the northern half, containing Hay, Bennett and Moss Streets, has been subjected to four plans of survey done by three different surveyors! Six reference marks were placed, of which two survive. Since 1924, the southern half, containing Darwin, Huxley and Deakin Streets, has been subjected to 24 plans of survey done by 23 different surveyors. So, is it a case of the more surveyors who work on a road, the more likely it is for the road to change its fix? Land and Property Information (LPI) may find this example re-markable!



Figure 6: Road layout and subdivision pattern showing surveying activity.

4 CAN A STREET FIX BE FIXED AND STAY FIXED?

What can be done differently to circumvent the above results? What can be done in areas away from West Ryde? It is required that suitable survey marks are placed to define road boundaries, i.e. stable marks that will last for a very long time? Would it not be great to have survey marks located, on the boundary, at the end of every road? How easy would boundary surveying be then? How much time would be saved? City of Ryde has been trialling several ideas in an attempt to arrest the widespread loss of marks and monuments which define and fix road boundaries.

4.1 Corner Re-Marks

The idea of placing a galvanised iron (GI) pipe at a street intersection is an old idea (Figure 7) that needs to be re-visited. These roads were created and marked in 1923 and 1926, but it is unknown when the GI pipes were placed.



Figure 7: GI pipes found at two intersections: Beaumont Ave, Denistone and Moira St, Denistone West.

At Ryde, much thought was given to what other type of long-lasting stable mark could be used to indicate a road intersection. Initially, a wooden peg within a metal cover box was tried (Figure 8), but this was considered to perhaps have some ambiguity with a lot corner mark. Consequently, the use of a short steel star picket is now being trialled (Figure 9).



Figure 8: Road intersection at Teemer St, Tennyson Point, where a peg was placed.



Figure 9: Intersection at Parklands Rd, North Ryde, where a star picket was placed.

There are many situations where an intersection point is not suitable for mark placement, e.g. if it falls on a road surface or service installation. In such situations consideration has been given to marking the actual corner at the property boundary. Trials determined that the simplest, cheapest and most readily available mark for the occasion is a standard wooden peg beneath a metal cover box. A peg by itself has little chance of a long life, however combined with a cover box, the whole game changes. In Ryde, if surveyors provide the peg at the road corner, Council will provide the cover box (Figures 10 & 11). In both of these examples, the fencer has arrived long after the corner has been marked and cover-boxed. The new fences have been erected in such a way that the corner marks have been preserved.

At Chatham Road, a new brushwood fence has been placed slightly inside the property boundary, which allows clear and easy access from the road to the mark (Figure 12). It should be noted that the fencer has kindly checked out a section of the bottom rail to enable lid opening.

Many residents are excited by the idea of having their lot corner preserved. Then there is the question of what happens if the boundary needs to be fenced? Substantial structures, such as a brick fence, block fence or dressed stone fence are declared in a Development Application (DA) and given a DA condition, which specifies that the face of the fence be erected on the boundary line, the position being verified by the site surveyor after construction. Two occasions have occurred (Figure 13) when City of Ryde provided the boundary information and the new rendered fences were erected on the road boundary lines. These new occupations are likely to be in existence for decades, and will be especially useful in the future, knowing the surveyors' penchant for adopting occupations at the ends of roads when reference marks have disappeared.



Figure 10: Road widening at Balaclava Rd, Eastwood, where a peg was found.



Figure 11: Corners at intersection of Chatham Rd and Dickson Ave, West Ryde.



Figure 12: New brushwood fence is erected inside the property line and allowance made for lid opening.



Figure 13: Samuel St, Ryde and Ford St, North Ryde.

4.2 Reference Re-Marks

Since the demise of alignment marks, old stone kerbs and concrete blocks which were placed to indicate the road boundaries (Hallman, 1973; Marshall, 2006), great reliance has been placed on drill hole and wing reference marks placed in concrete: concrete kerbs, concrete gutters, concrete footpaths, concrete driveways and concrete drainage structures. Such concrete provides a great medium for traverse stations and base marks but is totally unsuitable for ensuring a long-lasting survey reference mark. Figure 14 shows the stockpile of concrete removed from the roads in the City of Ryde in just one year. This pile of concrete from 2014, comprising 6,400 m³, has now been crushed and recycled as roadbase. The beginnings of the 2015 stockpile are shown in Figure 15, and already it consists predominantly of kerbs.

Use of buildings for reference marking is, once again, not a new idea but one well worth reinforcing within the surveying industry. Ever since the original alignment surveys, the old Water Board detail surveys and the City of Sydney detail surveys (Cadogan, 1996), buildings have been used as monuments to aid in the definition of road boundaries. In DP395460 (1955) the surveyor placed an “RM Nail in Bk Wall” (Figure 16) to reference a bend in Marlow Avenue, Denistone.



Figure 14: Stockpile of concrete removed from the roads of one council in one year (2014).



Figure 15: Stockpile of concrete removed from the roads of the same council in one month.



Figure 16: Reference mark using GI nail in brick wall.

This mark has subsequently been used by surveyors in subdivision and redefinition surveys in 1975, 2004, 2007 and 2014 to re-establish the road boundary. That is a life of 60 years so far. What are its chances of survival for another 60 years? Unfortunately, slim! This residential

area is currently undergoing a vibrant renewal, with new dwellings and duplexes rapidly replacing the first homes. Which buildings, today, are likely to be suitable as the next repository of a survey reference mark? Suggestions include new dwelling houses and new apartments (each of which would expect a lifetime of many decades), government buildings and heritage listed buildings (Figure 17). Obviously, free and unimpeded access to the mark must be a consideration.



Figure 17: Very old Survey Bench Mark in face of a heritage building in Parramatta.

During a recent conversation had with a boundary surveyor, who was preparing a site in Ryde for a major redevelopment, it was impressed upon him that the placing of survey reference marks in concrete kerbing was perhaps not the best option. “So, what am I supposed to do, place GI pipes?” Actually, this is a very viable option. At this site the ageing kerbing and footpath will probably be totally replaced during the redevelopment. Obviously, any reference marks placed in concrete during the boundary definition phase would probably not last two years! A GI pipe (with cover box placed by Council) on the other hand, positioned above existing telecommunication (telco) and electricity ducts has a great chance of surviving for many years. Service trenches are unlikely to be re-dug as surplus ducts are placed during the initial trenching. In fact, it is quite a nice twist to think that GI pipe reference marks could go back into the space where telco was so destructive of reference marks prior to 1960.

4.3 SCRIVS

For decades, a handful of surveyors have been taking advantage of large telco pits and large electricity pits as suitable sites in which to place survey marks (Figure 18).



Figure 18: State Survey Mark in telco pit, reference mark in pit, and Bench Mark in pit.

The huge advantage of the large telco pit, apart from its size and bulk (there is more concrete comprised in such a pit than in a SCIMS Permanent Mark), is that the pit is virtually untouchable. It is extremely rare that any civil works even consider moving or adjusting a telco pit. The telecommunication companies themselves are loathe to adjust an existing pit, preferring instead to construct a totally new pit adjacent and on line. In fact, the telco companies have no maintenance program in place for their older network pits. Many of these pits have already been around for 60 years and there is every reason to think that they will continue on for many more decades. However, there is one major hazard when utilising the concrete on the top of a large telco pit: the possibility that any footpath upgrade will tamper with or remove the top edge of the pit. Paving work has been interfering with the tops of large telco pits for years (Figure 19).



Figure 19: Old concrete path laid up to very edge of the metal lid frame.

Other examples (Figures 20 & 21) also show why the concrete edge of a telco pit may be unsuitable. It is becoming common practice to remove the concrete edging and pave right up to the pit lids. These town-centre paving works were all done in 2014 and are clearly a sign of the future.

What remains visible and viable after the paving work is finished is the metal frame which holds the pit lids in place. City of Ryde has been trialling the placing of a quick, cheap and obvious mark into one corner of the metal frame of large telco pits. This mark is a 3 mm diameter drilled hole, into which is hammered a humble clout (Figure 22).



Figure 20: Preparation of a telco pit during a footpath upgrade and the finished result.

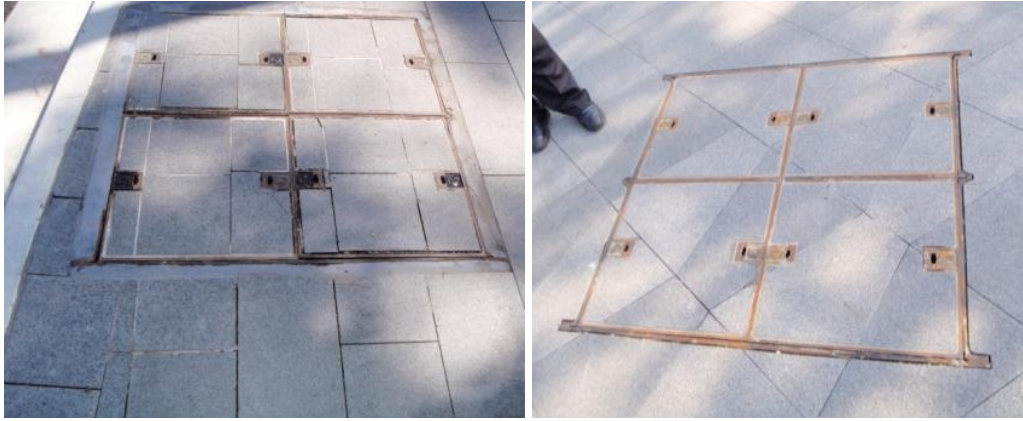


Figure 21: Waterloo Rd, Macquarie Park and Parramatta's Centenary Square.



Figure 22: Two examples of SCRIVs placed in lid frames.

City of Ryde believes that Survey Control and Referencing Is Vital (SCRIV), and what we are trying to achieve is a system of marking that has a great chance of lasting more than 60-70 years, or at least three generations of surveyors. It is only fitting that our special mark is called a SCRIV, named after Mr Surveyor Charles Robert Scrivener, who was so keen to leave long-lasting marks. He gave us such impressive monuments as big stone alignment posts, Burrenjuck Dam, the Murrumbidgee Irrigation Area and Canberra. We believe that a SCRIV has a much better chance of long-term survival than marks placed in concrete kerbs or concrete paths (cf. Figures 14 & 15). Unfortunately, not every road has a usable large telco pit.

Surveying students at the University of New South Wales (UNSW) have had an inkling of the use of SCRIVs for years now as evidenced by a drilled hole found in a large telco pit on campus near the Civil Engineering Building (Figure 23). For the naysayers, the author has managed to find one example in Ryde where a SCRIV would have been a failure, noting that the entire metal frame has been broken away (Figure 24).



Figure 23: Drill hole found placed in lid frame at UNSW.



Figure 24: Telco pit with major damage, including missing concrete and metal frame.

4.4 Control Re-Marks

A recent audit of SCIMS control marks throughout Ryde indicated that 149 marks have been destroyed (out of a total of 1,202 marks placed). An investigation of these lost marks was carried out to determine the age or lifespan of each mark (i.e. when was the SCIMS mark placed). Deciding to adopt 20 years as a starting point, a tally was made from the lost marks. 101 marks (i.e. two thirds) were younger than 20 years. How many of these marks were PMs? How many of these marks were brass SSMs? The staggering result was that one lost mark was a PM, and 100 lost marks were SSMs! Obviously the reliance and practice of placing SSMs in concrete kerb and gutter and concrete footpaths is rapidly failing in an area such as Ryde (again, see the stockpiles of concrete in Figures 14 & 15). Enquiries at LPI uncovered another important statistic. SSMs are sold to surveyors in urban areas at a rate of 10-to-1 compared to PMs. This suggests to me, that with SSMs having such a very short life, that up to 90% of LPI resources, when it comes to SCIMS marks, is being directed towards coordinating and levelling SSMs when a much better outcome would be to spend 90% of the LPI effort on PMs! This leads to another observation that was made in the City of Ryde: All of the 149 destroyed SCIMS control marks had been lost from sites within the road reserve. This leads to the next suggestion: Only PMs should be placed in the road reservation, while SSMs should be placed in parks.

4.5 Marks in Parks

In parks there is more likelihood of having a suitably clear site for Global Navigation Satellite System (GNSS) observations (Figure 25). In a heavily treed area, like Ryde, most streetscapes do not provide ideal locations for precise GNSS positioning. LPI is moving in this direction

with its placement of marks for major control networks. Losses of SCIMS marks in road reservations have become so frequent that the control network being established in Carlingford is utilising this notion of marks in parks.



Figure 25: Ryde Park showing easy access and clear skies.

The City of Ryde survey team is likewise using parks as sites for control marks (Figure 26). Galvanised star pickets at Granny Smith Memorial Park were placed in conjunction with the building of and upgrading of a new children's playground.



Figure 26: SS79424 placed 20 years ago at Portius Park, East Ryde, and galvanised star picket placed in 2014 at Granny Smith Memorial Park.

5 CONCLUDING RE-MARKS

Fixing the boundaries of roads in such a way that the definition lasts a very long time necessitates a wholesale change of thinking as to the methods surveyors now use to mark the road boundaries. Which way should the surveying industry head when it comes to corner marking, reference marking and control marking? This paper proposes that a simple wooden peg with metal cover box can have a long life expectancy, that marking of road intersections is worthwhile and should be encouraged to continue, that placing survey reference marks in concrete kerb and gutter, concrete footpaths, concrete driveways, concrete drainage structures or concrete edging is a short-sighted practice and should be actively discouraged, that State Survey Marks should leave the road reservation and be placed on community land in parks, and that a clout or pin placed in the metal frame of the lid support on a large telco pit may be

a suitable alternative as a reference mark when it comes to fixing a street. What happens next is up to you!

ACKNOWLEDGEMENTS

The most valuable assistance and support from Mr Surveyor, Ian Marshall, retired (as if surveyors ever retire!), and undergraduate surveying student, Albert Li, whose upcoming UNSW thesis (2015) is overlapped by part of the material in this paper, are gratefully acknowledged.

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