

# **The City Line in Stockholm, the longest three dimensional property unit in Sweden**

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**Key words:** Access to land, Cadastre, Legislation, Urban renewal, three dimensional property unit

## **SUMMARY**

When the railway running through the capital of Sweden, Stockholm, was built in the 1800s the result was two tracks for rail traffic. Today, Stockholm still has the same number of tracks, despite the fact that the ten trains per day that passed through in 1871 has increased to around 550 trains per day by the 2000s. These two tracks have also created a bottleneck in the Swedish rail transport system and to increase track capacity through Stockholm in order to overcome this problem the Stockholm City Line is to be built. The Stockholm City Line is a completely new railway for commuter train transport, which is being constructed in a tunnel underneath central Stockholm. In the following we will tell you more about the Stockholm City Line and describe some of the tasks the surveyor has in the project. Among other things the Swedish Rail Administration is testing a rather new legislation for 3D property units when securing the space for the tunnels.

## **SUMMARY**

När man byggde järnvägen genom Centrala Stockholm på 1800-talet, byggde man två spår. Det är samma två spår som fortfarande trafikeras. Idag på 2000-talet passerar 550 tåg/dygn vilket kan ställas i relation till de 10 tåg /dygn som passerade när spåren byggdes. Dessa spår utgör idag en flaskhals som påverkar hela Sveriges tågtrafiksystem och för att åtgärda detta byggs Citybanan. Citybanan blir en helt ny järnväg för pendeltågstrafik och byggs i en tunnel under centrala Stockholm. Artikeln berättar om Citybanan och om lantmätarens roll i projektet samt de intressanta arbetsuppgifter som finns. Bl.a så testar Banverket en relativt ny lagstiftning om tredimensionell fastighetsbildning för att säkerställa utrymme för tunnel och stationer.,

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## 1. INTRODUCTION

Currently, there is a great demand for qualified surveyors in the Swedish property market, predominantly within the metropolitan regions, where development activities and some aspects of infrastructure improvements can be very intensive. Major projects, under both private and public auspices, can sometimes place high demands on resources; this is where surveyors play an essential role, both by reducing the loading on resources and by providing good advice over short periods.

Infrastructure improvement spans a broad spectrum of issues. Surveyors are known for their broad-based skills within the area of property, including everything from valuing properties and assessing encroachments to implementing and producing information bases for decision-makers. One current example in Stockholm is the development of the Stockholm City Line: a railway tunnel under Stockholm that is approximately 6 km long and includes two new stations in central locations. This project affects around 300 properties. These properties are all, to a greater or lesser extent, affected by the encroachment caused by Stockholm City Line. The purpose of this report is to describe the project, the broad spectrum of work tasks for the surveyor and the areas in which surveyors are involved during major infrastructure projects such as the Stockholm City Line.

## 2. HISTORY – COMMUNITY DEVELOPMENT

The railways first came to Sweden in the 1800s and railways were built north and south of the capital, Stockholm. This subsequently caused problems as the northern and southern sections were not linked in any way, and in the 1850s a decision was made to link up these sections. 1871 saw the opening of two tracks for rail traffic through Stockholm, the Connection Line (*'sammanbindningsbanan'*), joining the two railheads. One of the tracks was intended for mainline traffic and one for local traffic. Today, Stockholm still has the same number of tracks, despite the fact that the ten trains per day that passed through in 1871 had increased to around 550 trains per day by the 2000s. These include commuter trains, regional trains, long distance mainline trains and freight trains. Maximum use is being made of these tracks and the Swedish National Rail Administration, which grants track use rights to the providers of transport services, has been forced to turn down prospective increases in traffic despite there being a great need for rail transport. A large number of people have also moved into Stockholm. The city has been developed in stages, but the expansion of its infrastructure has not progressed in pace with Stockholm's overall other development. Infrastructure is required to be able to create the society that people seek; people want to be able to choose where they live and work, and they then need to have good options available for commuting.



Eight out of ten train journeys made in Sweden start or end in Stockholm. In addition to this, there are all the journeys made by commuter trains. A disruption to rush hour traffic often has major consequences. These consequences not only affect commuters in Stockholm as the impact of such disruptions may also ripple further out into Sweden. This lack of capacity also has an impact on the expansion of rail transport in Stockholm and the rest of Sweden; the expansion desired requires an increase in capacity.

Over time, the two tracks have also created a bottleneck in the Swedish rail transport system and in 2000 the Swedish National Rail Administration was assigned by the Government of Sweden to plan for increased track capacity through Stockholm in order to overcome this problem.

### 3. THE STOCKHOLM CITY LINE

An investigation conducted by the Swedish National Rail Administration showed that rail transport could be broken down into different kinds of train. This led to the Stockholm City Line, which is a completely new railway for commuter train transport, which is being constructed in a tunnel underneath central Stockholm. The tunnel extends from the existing commuter station at Stockholms södra, under Södermalm, Söderström, Riddarholmen, City, Vasastan and ends at Tomtebodavägen. Two completely new stations will be built, the City station and the Odenplan station. The two new tracks on the Stockholm City Line will double capacity, and when the commuter trains get their own track through Stockholm via the Stockholm City Line, the capacity of the existing tracks above ground will increase for other trains, such as mainline trains, regional trains and freight trains. This will obviously reduce the risk of disruptions and more trains will be able to pass through Stockholm during peak periods. The completion of the Stockholm City Line will also provide scope for the increase in traffic that is currently required and which will also be generated through other track improvements planned elsewhere in Sweden.

#### **4. SUSTAINABLE DEVELOPMENT (ENVIRONMENT)**

The Stockholm City Line has been constructed to create a long-term, sustainable transport system. When commuter trains have their own tracks through Stockholm, two million inhabitants in the Mälär Valley (Stockholm's regional environs) will have access to both a greater number and more punctual train links to the capital. The ambition is that more and more people will leave their cars at home, which will have a positive effect on the environment. Trains are fuel efficient and emit low levels of carbon dioxide; all-in-all, the railway represents less than one per cent of the air pollution produced by the Swedish transport sector. Using rail transport, whether this be for passengers or freight, is nearly always better for the environment than other forms of transport; only walking, cycling or sailing can be claimed to compete with railways in this respect.

#### **5. PERMITS**

According to Swedish legislation and our democratic processes, many development matters must be considered in accordance with administrative and judicial procedures, and those affected by the development of infrastructure must also be consulted. Today, you often hear of protracted and complicated permit procedures resulting in major delays and consequential risks. Permits issues are perceived as representing major obstacles and it may be impossible to establish accurate and realistic time schedules.

Surveyors are affected in many ways during the planning process and when permits are required:

##### **5.1 Preliminary study**

After being assigned by the Government to resolve the bottleneck in Stockholm, the Swedish National Rail Administration conducted a **preliminary study**. This study examined and evaluated three different alternatives, only one of which proved to be a satisfactory solution to the capacity problem: a commuter train tunnel, which later came to be known as 'the Stockholm City Line' (*Citybanan*).

**5.2 The Railway Inquiry** defined the route in more detail and looked at locations for the stations. In 2005, the Government of Sweden made a 'decision on permissibility' for the Stockholm City Line and the proposed route through Stockholm. Among other things, a 'decision on permissibility' means that the environmental impact is examined at an early stage and this decision also governs future environmental licensing proceedings. As of this stage, the development cannot be halted by another authority or judicial decisions; it can only be modified. The Government also imposed a number of conditions in conjunction with this decision, which were to be investigated further prior to the confirmation of the Railway Plan.

**5.3 The Railway Plan** – governs the building of the railway under the Railway Construction Act. Among other things, the Railway Plan specifies the location of the facilities in detail together with their design. The Plan, together with technical documents produced earlier in the project, describes the design and implementation of the facilities. The purpose of the Railway Plan is to facilitate the grant of the necessary rights of control over the land and

buildings required to construct the railway, but it may also be said to give the Swedish National Rail Administration the powers to carry out the construction of the Stockholm City Line. The Plan describes the areas that must be used for track tunnels, stations and entrances/exits; it also describes how the construction work will be carried out and how the facilities will be created. Both permanent and temporary claims and requirements are also reported. Temporary claims to use land and buildings may involve areas for works and sites, stores, access roads and works tunnels.

**5.4 Environmental Impact Assessment (EIA)** - an EIA will also be drawn up as an appendix to the Railway Plan. This should enable a cohesive assessment of the project's impact on the environment, health, safety, the management of natural resources and the general physical environment at the construction and operational phase. Besides the impact on the environment, the EIA also describes possible measures that may be required to prevent or mitigate adverse effects. The county administrative board will examine and approve the EIA and also determine whether it covers all significant environmental impacts, whether such impacts have been described sufficiently well and whether the consultation has been carried out in accordance with the statutory requirements.

**5.5 Detailed Development Plan** – governs how the property owners may build on their property units, both above and below the ground. As a rule, the new Detailed Development Plan relating to the Stockholm City Line does not affect building rights above the ground except as regards the design of station entrances and adapting these to the urban development. Properties located above the Stockholm City Line will have their rights to build underground restricted. For example, some of these properties may be unable to install geothermal heating systems or build underground garages in the future. Although the Detailed Development Plan is drawn up by the Municipality of Stockholm, this is done in collaboration with the Swedish National Rail Administration, as the information contained in the Railway Plan and Detailed Development Plan must be consistent.

**5.6 Environmental judgments** – govern the project's water operations, that is, how to reduce the groundwater with associated safety measures to reduce the risk of damaging the land and buildings affected. A review of the water operation for the Stockholm City Line was applied for under Chapter 11 of the Environmental Code. This relates to the diversion of groundwater from the rock tunnels and the construction of a concrete tunnel in Riddarfjärden. The Environmental Court considers these matters and grants permits subject to certain conditions.

**5.7 Formation of property units** – governs how appropriate, permanent property units may be formed considering land-use efficiency.

**5.8 Building permits** – govern building specifications and standards, and how the work should be implemented; a building permit is required before any building work can be started. Many permit and property unit issues are interdependent and many material issues can be resolved at an early stage by means of continuous information and feedback during the initial phase of the permit procedure work.

## **6. THE FORMATION OF PROPERTY**

### **6.1 The term “property unit”**

There is no specific definition of the term 'property unit' within Swedish legislation. The basis for this term is contained in Section 1 of the Land Code, which states that "Real property is land. This is divided into property units. Special provisions apply concerning property formation."

'Land' means both ground and water, but no further conclusions can be drawn from the wording regarding the physical scope of a property unit; instead, other acts provide guidance when drawing various conclusions about the content and formation of the property unit.

A 'normal property unit' can be described as a specific area on the ground or in the water with boundaries established by long usage or through administrative decision. However, the horizontal (two-dimensional) boundaries of a property unit that has boundaries marked on the surface of the earth also includes the air space above it as well as the space under the ground. Theoretically, this could be described as being cone-shaped, with the point in the centre of the earth, and reaching infinitely out into space. However, it would appear that it is considered that some form of delimitation applies, and the interpretation applied is that the land extends upwards and downwards to the limits of what could conceivably be used by anyone.

It has consequently been historically impossible in Sweden to determine that a property unit should be defined in the vertical plane, both upper and lower, any further than as described above. Therefore there is no possibility of stacking different property units onto one another.

But, in 2004, new legislation was passed in Sweden whereby properties can also be delimited as regards both height and depth (i.e. vertically) and not just delimited horizontally, as was the case previously. A property delimited both horizontally and vertically is referred to in the Land Code as a 'three-dimensional (3D) property unit'.

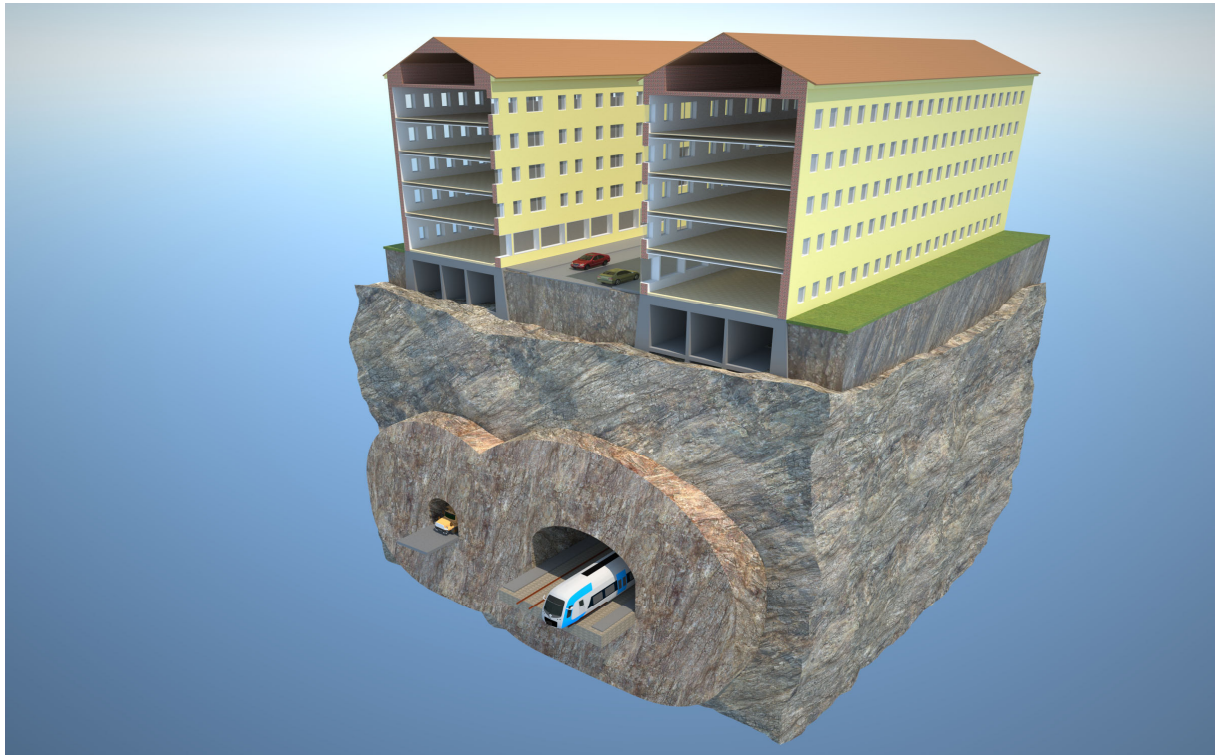
### **6.2 Formation of 3D property units**

Up until this legislation, easements were historically the most common way of securing space in Sweden for e.g. tunnels. Up until 2004, when it became possible to form 3D property units, there was no alternative to easements. The advantage that 3D has over easements here is that the Swedish National Rail Administration will own and have full control of the space for tracks and a protection zone. No other interested party will be able to make a claim on these spaces.

As this legislation is rather new and has not yet been considered by the superior courts, no-one knows how the legislation will function in the event of a compulsory purchase situation. What would be the outcome of legal proceedings if negotiations are unsuccessful and the property owners affected do not consent to having a tunnel underneath their building? Could the new act be used for this purpose with a view to expropriation? This is a question that still



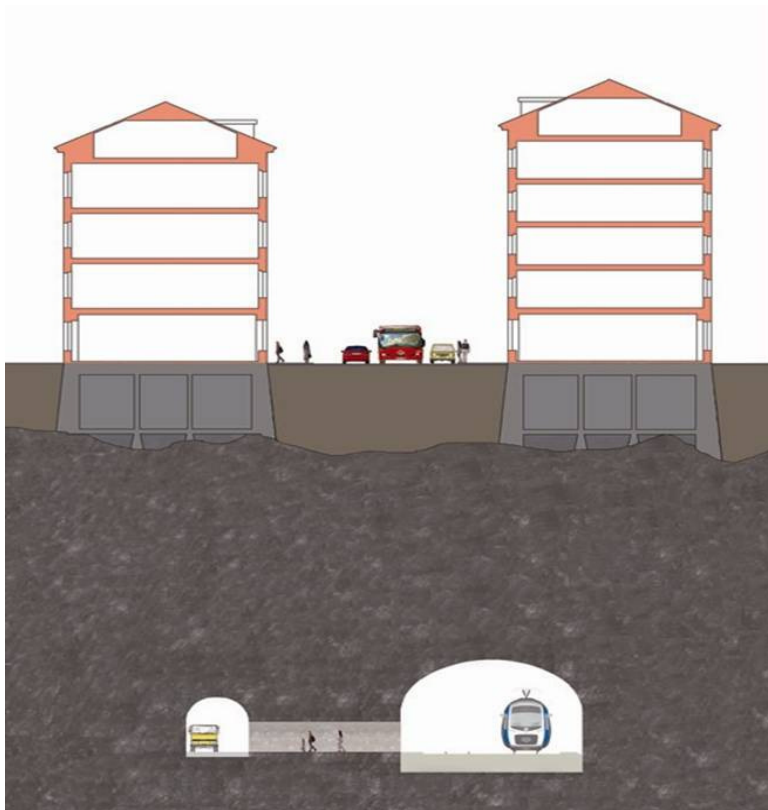
remains unanswered, although we can see major advantages in utilising the 3D alternative instead of the other methods available for granting control. It is also considered that this would make it much easier in the future to transfer track or station spaces or parts of such spaces to a third party. There are also impediments in the traditional legislation, such as encroachment to a structure that is appurtenant to a site leasehold property and thus considered to be personal property; furthermore, a public authority easement cannot be formed, but the encroachment required must be resolved in some other way. The Swedish National Rail Administration is now testing to see if all questions can be resolved via the new legislation on the formation of 3D property units.



### 6.3 Appropriate manageable units

There are currently around 300 property units that will be diminished by the 3D property units required for the Stockholm City Link, and it is vital that we already at this stage create appropriate manageable units and make plans for the future operational phase. An application was presented for land survey administrative procedures and property unit formation procedures regarding the entire stretch, but this has since been divided into around 40 land survey cases, each of a manageable size; for instance all property units within a block are dealt with under the same land survey case. The processing of each land survey case is then synchronised with the start of construction work at the respective block or area. At the outset, it was planned that the Stockholm City Line would belong to one property unit, but following a closer study of the future administrative phase, it was decided that three underground property unit spaces would be created. Three-dimensional property unit spaces will be created for track and service tunnels as well as for a protection area of around 10 m outside the tunnel walls.

If it is chosen to form property units in this way under the new legislation, the project must produce cadastral drawings of the facilities, tunnels, stations and entrances/exits. These drawings will then be submitted to the National Land Survey of Sweden to be appended to the cadastral documents. Layout drawings, longitudinal sections and cross sections will be drawn up for the tunnels. It is estimated that approximately 20 layout drawings (A3), approximately 20 longitudinal sections (A3) and approximately 200 cross sections (A4) will be required for the tunnels alone. Drawings will also be required for the two stations, including platforms, lifts, escalators, various intermediate levels, etc. Furthermore, details must be provided about links to the existing underground system, for which easements have currently been granted.



## 7. NEGOTIATIONS

The Stockholm City Line project will endeavour to conclude agreements with the property owners affected by the encroachment. There may, for instance, be an encroachment when building station exits/entrances or carrying out reinforcement work in cellars or tunnels with protection zones underneath a building.



The permit procedures require parallel negotiation work; all those affected will want information and it is on these occasions that we can establish contact with the property owners, business and other operations affected by the project. The most important task is to build trust for our forthcoming work; our objective is that everyone should perceive that we are doing what we can to resolve their situation in the best possible way within the given parameters. Everyone should feel that they are benefitting by settling/reaching agreement, so that the project can keep to its time schedule.

All negotiations are prepared very carefully; it is necessary to put oneself in the shoes of the other party and consider: what would I be thinking if I were on the other side of the table? This is the starting point of our work so that we can avoid protracted judicial proceedings.

Negotiations comprise the following components:

Preparation – the crucial element – if we are not well prepared, the other party may consider that we do not really appreciate the issues involved

First impression – instil confidence and describe the goal profile – what do we want to achieve?

Information – including the analysis part – obtain information about the other party's situation and their own perception of the situation

Describe solutions/proposals – give and take on the basis of the goal profile

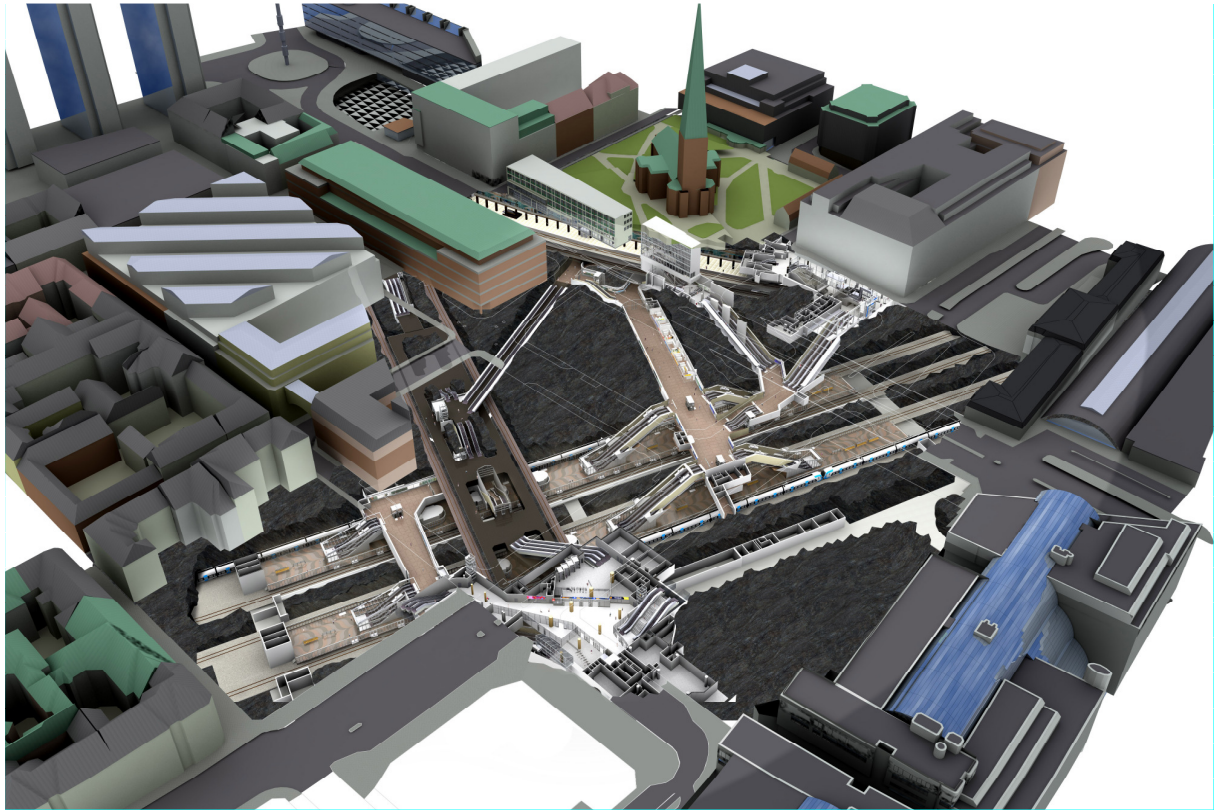
Reach an agreement – summarise and document

Follow up during the course of the work – did it work out as we said it would or will we have to make some modifications or adjustments

## **8. CONSTRUCTION WORK**

Most of the stretch is being built as a double-track tunnel that splits into several single track tunnels when approaching the stations. The double track tunnel is approximately 12 m wide and approximately 7 m high. A rescue and service tunnel is being constructed along the entire stretch. The Stockholm City Line stations will also be linked to the existing underground system, for which reason a number of intermediate levels are being built. The rail tunnels will be located 10 to 40 metres under the existing ground surface.

When the Stockholm City Line is constructed, the tunnel will be cut by blasting, as Stockholm's bedrock is more suitable for blasting. A concrete submerged tunnel of just over 300 metres long will also be built in Riddarfjärden.



It is planned that the construction work for the Stockholm City Line will take approximately nine years and will affect major parts of central Stockholm. The tunnel will be built both through rock and underwater, and Stockholm will be affected in many different ways. Underground traffic will be affected for three summers, when two of the underground lines will be closed to traffic in central parts of Stockholm close to where the Stockholm City Line is being built. Other lines may also be affected by the blasting work, as the traffic may sometimes have to be stopped temporarily. As this may go on for several years, the Swedish National Rail Administration has concluded agreements with the owner of the underground (Stockholm Transport – SL) regarding fixed blasting times during off-peak periods. Large parts of Stockholm will also be affected by noise during the construction period, primarily drilling noise. It is very important for these issues to be coordinated to reduce disruptions. It is planned that the Stockholm City Line will be ready to be put into operation by 2017.

## **9. LOSS ADJUSTMENT**

Loss adjustment is primarily carried out in advance where the scope of the damage can be assessed, but this is not always possible. Many business owners have found it difficult to estimate in advance the income that will be lost as a result of customers being unable to get to their shop, restaurant, etc. and opting to go somewhere else instead. Traffic problems and queues often result in people choosing another route or going somewhere else to do their business or errands. In such situations, preliminary compensation may be paid in advance and

then, some years after accessibility has returned to normal, the operation's turnover before and after the Stockholm City Line was constructed can be assessed. This means that loss adjustment may continue for several years after the line has been put into operation.

Business losses are difficult to predict, which also makes it difficult to estimate budgets for the project. The City station is being built in Stockholm's most central location and the properties above the facility command the highest property prices in Stockholm. They are also likely to house hotels, conference facilities, museums and theatres. Building work at the stations is expected to last for several years and the tunnelling will take place during several periods. Here, it is assumed that damage to business is unavoidable.

One of the station entrances comes out at a property that is currently run as a hotel. It is not only the tunnelling that will affect the hotel, but construction work for the Stockholm City Line will also be carried out inside the building, and it will consequently be impossible to avoid a negative impact on this business.

## **10. CHALLENGES – COMPLEXITY**

This project is something of an 'El Dorado' for a surveyor who likes a challenge. The complexity and diversity of the work tasks, as regards both intricacy and scope, are difficult to find anywhere else in Sweden right now. The Stockholm City Line is a highly complicated engineering project, with advanced solutions to prevent existing buildings and other facilities from being damaged. The environmental licensing proceedings and also being able to make an overall assessment of all of the consequences of the project have claimed a great deal of the surveyors' time and skill. Coordinating how all of the permits are dealt with in the courts in combination with a continuous stream of amendments regarding technical solutions has necessitated the employment of a flexible approach. We have sometimes focussed on investigating the issues of the day while at the same time always being aware of the project's overall objective, namely, to resolve the bottleneck in the Stockholm rail traffic system within the specified time schedule and budget.

The project extends through central Stockholm, where some of the most valuable properties in Sweden are located. Different technical solutions will have a different impact on the financial outcome and our approach sought to identify any potential in all of the project solutions; what synergy effect would the change to an affected property have and what would the impact be of having a new commuter station as a neighbour?

The various legal proceedings and the reviews under various statutory rules have tested the nerve of many a surveyor. Not always knowing what the legal outcome would be has sometimes resulted in surprises and the acquisition of new knowledge, but has often also confirmed our competence within the area. The 3D legislation as applied in the compulsory purchase of site leaseholds has not yet been considered by the supreme judicial instance, which calls for a 'Plan B' if such a review does not lead to a favourable result for the Swedish National Rail Administration.

One of the main tasks of the surveyor is to contact all of the property owners and other parties affected. It has been extremely challenging to build trust and have a common goal profile, at the same time as everyone knows that the railway must go through according to a set time schedule and budget.

Property officers assist the project manager by securing access to space in those properties required for the project. This work involves everything from participating in the initial investigations, as described above, until such time as all of the property issues have been concluded. The work involving:

- access to the land and space required to build the Stockholm City Line
- dealing with claims for environmental, property and business losses related to properties affected

This includes:

- dealing with matters relating to land needs and property issues
- dealing with valuation and permit issues as well as other property law issues
- participating in drawing up and maintaining an up-to-date schedule of property owners
- conducting contract negotiations with property owners and other contractual parties
- if necessary, adjusting losses for damage to real property or businesses
- developing and coordinating GIS issues in collaboration with the project's other data sections
- participating in and assisting at the project's information meetings
- assisting in the production of railway plans and detailed development plans, involving consultation with individuals, municipalities and other public authorities
- assisting the Swedish National Rail Administration's lawyers in court
- generally assisting the sub-project leader and the project's property manager

Representative for the surveyors is also involved in:

- participating in the management of the sub-project
- drawing up budget and time schedules for access to land, evacuation and loss adjustment and continuously following these up by debriefing and drawing up forecasts
- reporting on good examples and abnormal situations and deviations to actively contribute to the efficient feedback of experience gained

The budget for the Stockholm City Line Project amounts to approximately SEK 16 billion and is one of the largest projects in Sweden at the current time. All of the administrative parts of the project require the skills of a surveyor, everything from engineering and documentation to property law and finance, together with knowledge about implementation and negotiation skills. I can see that the role of the surveyor can develop to include the provision of skills for future major projects; just now, it is important to disseminate information about the broad field of work available for surveyors and thereby inspire young people to choose surveying as a profession. Railway projects, such as the Stockholm City Line, represent much more than just a railway.

## **11. BEING A SURVEYOR INVOLVED IN THE STOCKHOLM CITY LINE**

The Swedish National Rail Administration is investing in the development of young people and creating a climate of diversity at all levels of the organisation.

It is important that all projects have a mix of both younger and older staff, and by doing this the Swedish National Rail Administration also assumes responsibility for the ongoing regeneration of this group of professionals. As consultants, we have also noticed in other contexts that a mix of men and women, and younger and older people, is also being requested when consultants are procured.

Being able to work in the Stockholm City Line Project has been and still is great fun as it is a project that will have a very positive and enduring effect on Stockholm. We also find it worthwhile and enjoyable to have the opportunity to relate our experience of this exciting project and make others aware of the different roles that surveyors have in, for instance, major infrastructure projects. The development of the public transportation and traffic systems will continue, which will present new challenges concerning the problem with supply of resources. Surveyors constitute a profession that can be of great social value. By the dissemination of information and knowledge we can also promote a profession where strong growth is required to meet future challenges, and where it seems that demand for surveyors' services is going to outstrip recruitment to the profession.

## BIOGRAPHICAL NOTES



Karolina Rönnerberg is a land surveyor and works at Structor Projektutveckling AB. She has been working as a consultant in the Stockholm City Line Project since 2005 after finishing her studies at the Royal Institute of Technology, Stockholm. Prior to joining Structor Karolina worked with property matters for a law firm. Over the past few years, her role as a surveyor within the project has expanded. She was initially the officer dealing with property law issues, but now act as a coordinator for all licence and access issues for the City Sub-project, which is that part of the project which is located in the centre of Stockholm and where a new commuter station is to be built.



Ingegerd Hedmark, is a land surveyor. She studied Real Estate Economy at The Royal Institute of Technology in Stockholm where she graduated in 1984. She started her career as a Real Estate Valuer for Nordea but soon became property manager working for the municipal authority. In 1992 she started at the National Land Survey dealing with land unit formation.. After several years working for the government agency she moved to work for Stockholm Transport with land establishments.

Today Ingegerd is a partner at Structor Projektutveckling AB, a company she co-founded in 2004 .During her first three years with the new company as a consultant, 2004-2007, she worked with the Stockholm City Line. In that stage of the project the work primarily related to early planning and the foreseen effects on property owners.

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