CROWN CAPITAL ENTERPRISE LIMITED

WANCHAI, HONG KONG

Demonstration of Rejuvaseal™
Shun-PingGu Highway, Beijing Municipality
Peoples Republic of China

August 2001

TS^2 Consulting Inc.
Lamma, Hong Kong

CROWN CAPITAL ENTERPRISE LIMITED

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Shung-PingGu Highway, Beijing Municipality
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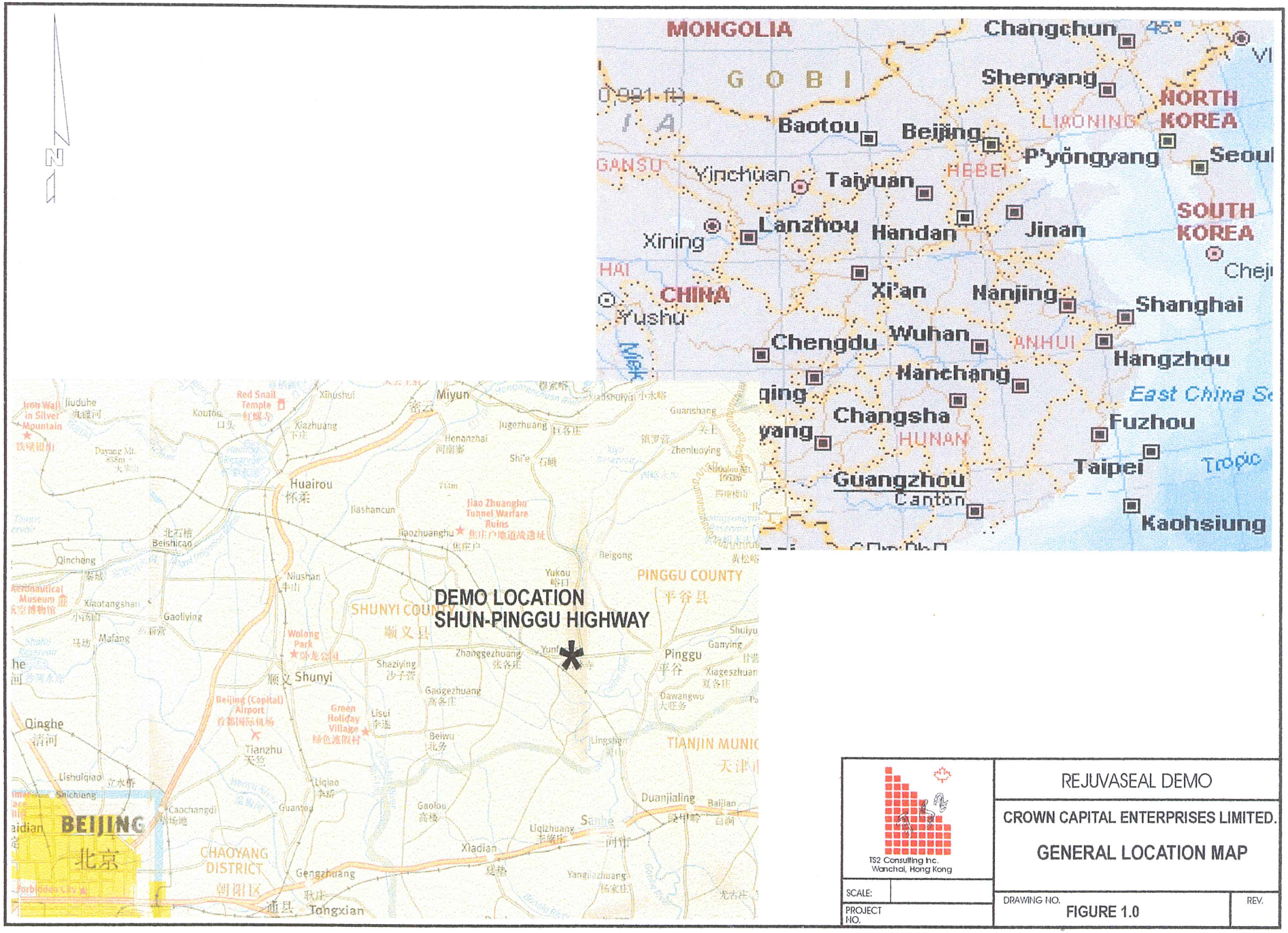
1.0 INTRODUCTION

Crown Capital Enterprise Limited of Hong Kong entered into an agreement with a unit of the Beijing Municipality Highway's Management Department, based in PingGu, China in August 2001. The agreement calls for the analysis of the performance of RejuvaSeal™, a sealer/rejuvenator for asphalt pavement on highways within the jurisdiction of the highway management groups area.

Beijing Municipality, surrounds the City of Beijing and is bordered by Hebei, Shandong and Liaoning Provinces. The town of PingGu is located in the eastern sector of the Municipality. See figure 1.0 for a map showing the location of PingGu in Beijing Municipality. PingGu and the majority of the area lies in the lowlands adjacent to the Gulf of Zhili (BoHai) and averages 50 metres in elevation. The regions' latitude (40 degrees north), mean that there are four distinct seasons, with temperatures ranging from 35 Celsius in the long, hot humid summer to –10 Celsius in the short, but frigid winter.

The asphalt in the area is manufactured from local materials, which is comprised of crushed and screened sandstone, granites, gneisses and limestone. In the immediate PingGu area, the rocks are from a sedimentary series thas been lithified and sandstone predominates. The bitumen binder for the asphalt is sourced from various locations, with Dalian in Liaoning province one of the principal sources, and refineries in Beijing and Tianjin, also being possibilities.



TS2 Consulting Inc. Wanchai, Hong Kong	REJUVASEAL DEMO
	CROWN CAPITAL ENTERPRISES LIMITED.
	GENERAL LOCATION MAP
SCALE:	
PROJECT NO.	DRAWING NO. FIGURE 1.0
	REV.

2.0 CO-OPERATIVE PROGRAM

The intent of the Agreement is to demonstrate RejuvaSeal™ at different locations selected by the Highways Maintenance Group, which will subsequently allow analysis of the performance of Rejuvaseal™ on a variety of asphalt surfaces. A demonstration was undertaken at 11 Km west of PingGu on August 23, on the seconday highway that leads from PinggGu to Shunyi, some 40 km west and known as highway S305. The section of highway at Km11 markerstone was paved in 1995. No details are known about the subgrade, but inspection of the shoulders in the fill sections of the highway, show a sandy-silty material. Knowing construction techniques in highways in China in general, minimal gravel would be used in the immediate coarse base, beneath the asphalt pavement.

3.0 REJUVASEAL™

RejuvaSeal is a proprietary product that was developed and supplied by Echelon Industries, Inc. of Canyon Lake (Austin), Texas, U.S.A. Rejuvaseal™ has been proven in numerous applications in North and South America to rejuvenate asphalt pavement at various stages of it's life and economically extend the life of the pavement. Rejuvaseal™ is a three component, asphalt sealer rejuvenator that is comprised of Coal Tar, Coal Tar Oils and Petroleum Solvents.

3.1 PRIOR EXPERIENCE

Refer to Appendix A for a copy of the brochure provided to participants at a seminar held in PingGu on August 23, 2001. This outlines the experience of Echelon Industries, Inc with Rejuvaseal™ at various locations in North America and South America. Further information is available on Echelon Industries, Inc website (info@airportservices.com). In summary, Rejuvaseal™ has been used at numerous airports in North and South America, as well as highways in Alberta, Canada; Cearo State, Brazil and North Dakota and Texas, as well as other locations in the U.S.A.

4.0 TEST PROGRAM

Since Beijing Municipality is located in a semi-tropical climate (Latitude: 40 North) at a low altitude (50 metres), it's a demanding setting for asphalt, given the year round warm climate (extremes of 35 Celsius in summer and –15 Celsius in the winter) and intense exposure to ultraviolet radiation, all which contribute to the oxidation and breakdown of the asphalt binder.

The PingGu-based, Municipal Highway Management Department is responsible in the immediate area for a growing system of primary and secondary roads.

In view of their growing network of roads, and the short life of the asphalt surface the PingGu-based, Beijing Municipality Highway Management Department is definitely interested in determining how to economically extend the life of the asphalt road surface. To this end, they have agreed to try RejuvaSeal™ on several sections of highway. The agreement led to a committee being struck to suggest appropriate locations for the testing of RejuvaSeal™. The 528 metre test section is located on Highway S305, 11 km west of the town of PingGu at the following geographic location:

Table 4.1	Geographic Location of Demo Site	
System	Northing	Easting
Geographic (deg, min)	40^0 08.639 '	116^0 58.697'
Universal Transverse Mercator (metres)	4443755	0498151

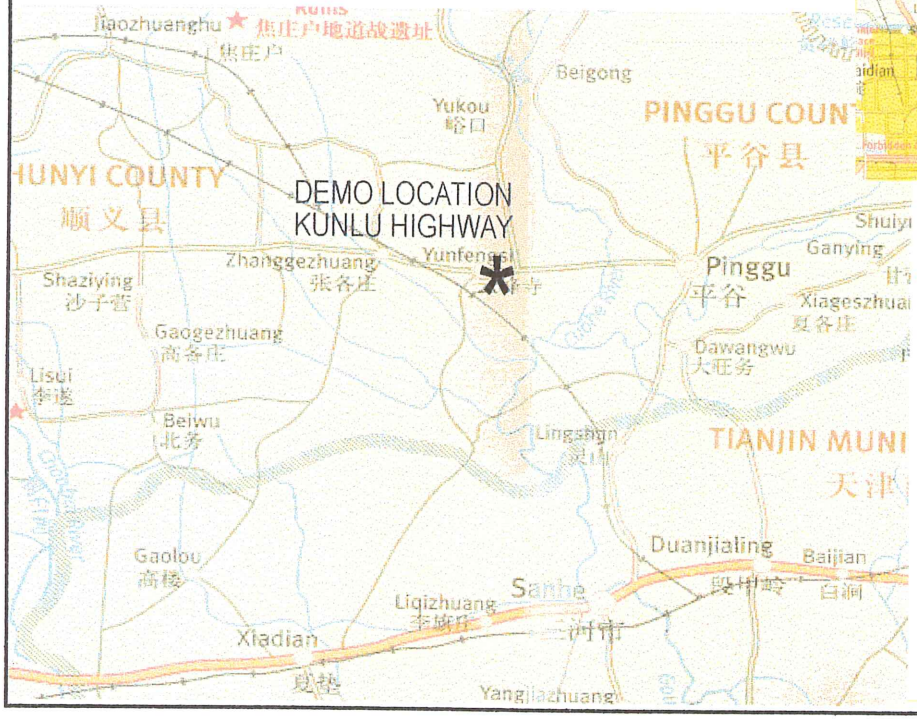
See figure 4.0 which follows, for a graphic presentation of the location.

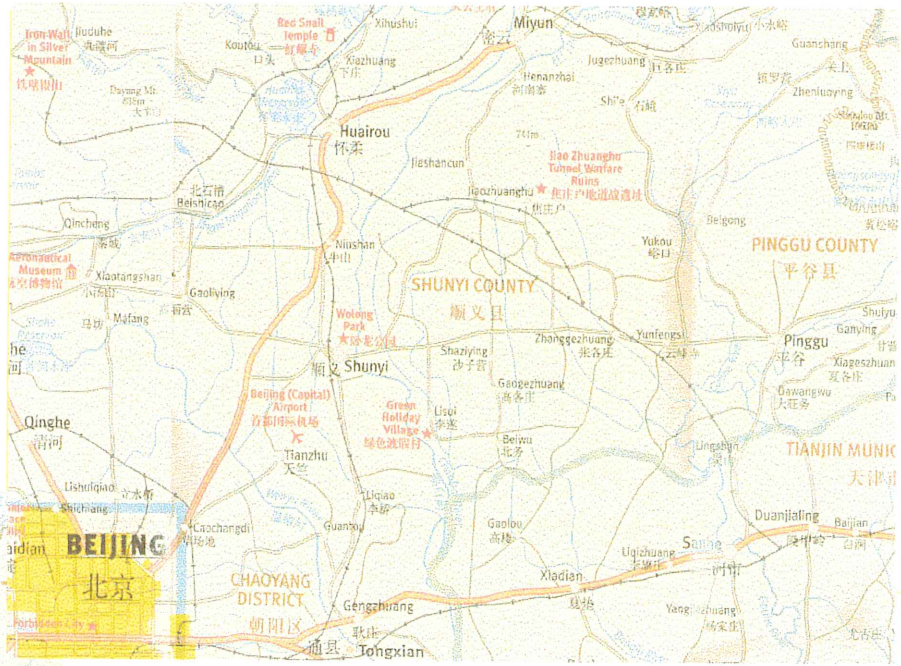
4.1 Test Section

On Aug 22, two test patches in immediate proximity to the demonstration section on the Shun-PingGu highway (Highway No. S305) were treated with RejuvaSeal™. See Figure No 4.1 for a photo showing the test patch implementation. Particulars of these two test patches are as follows:

Table 4.2			Particulars of the two test patches							
Test Patch Number	Patch Width (m)	Patch Length (m)	Total Area m^2	Total Area ft^2 approx	RejuvaSeal Applied		Application Rate			
					US gals	litres	USGal /ft^2	USGal /yd^2	Litres /m^2	m^2 /Litre
One	0.75	1.50	1.13	12	0.07	0.25	0.005	0.049	0.22	4.50
Two	0.75	1.25	0.94	10	0.07	0.25	0.007	0.059	0.27	3.75

Subsequent inspection of the two test patches on August 23 at 8 am showed no perceptible difference in the depth of penetration of the RejuvaSealtm, nor the surface reflectance of the RejuvaSeal.





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Wanchai, Hong Kong

	REJUVASEAL DEMO
	CROWN CAPITAL ENTERPRISES LIMITED
	LOCATION PLAN SHUN-PINGGU HIGHWAY
SCALE:	
PROJECT NO.	
DRAWING NO.	FIGURE 4.0
REV.	

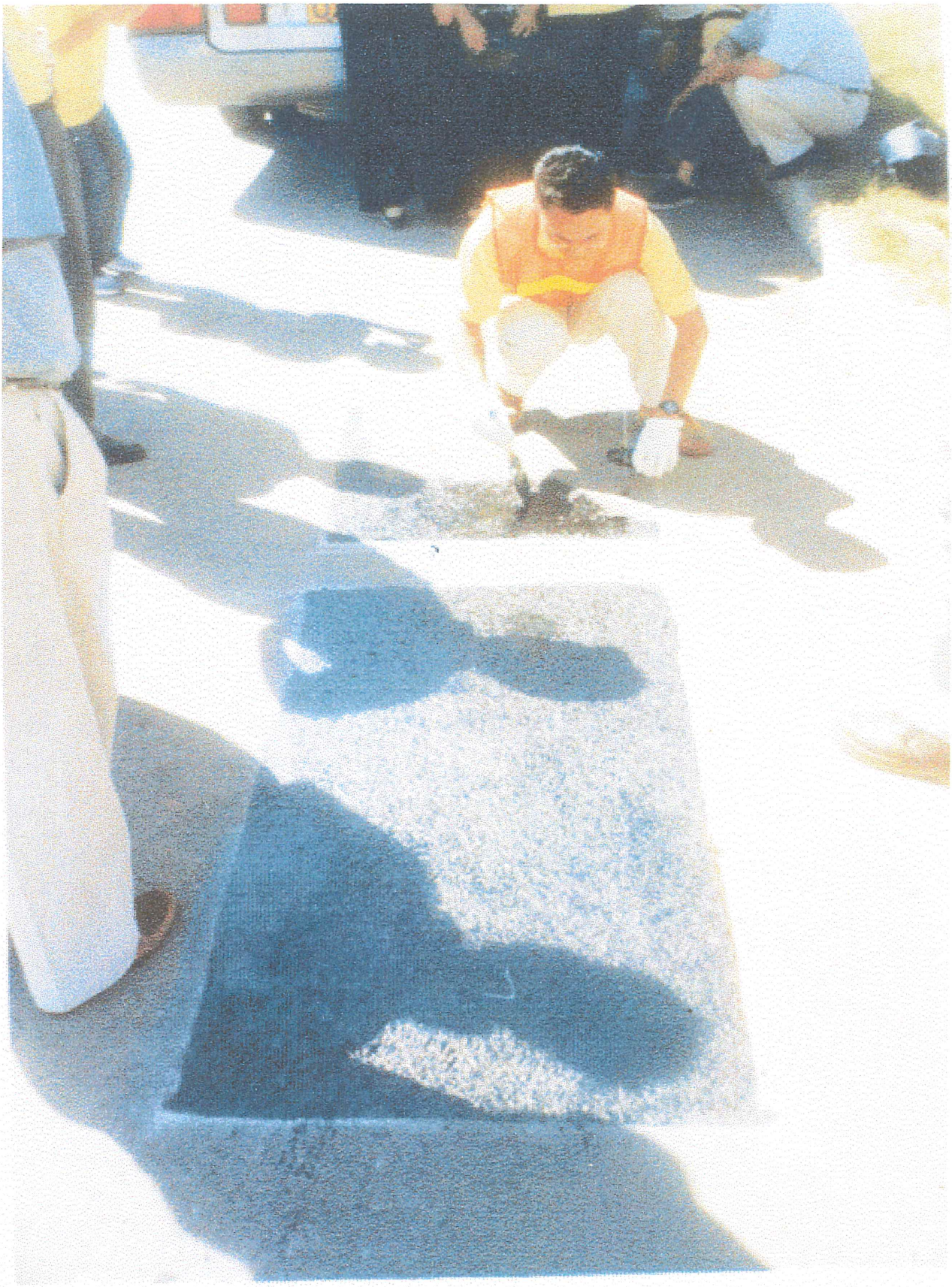


Figure 4.1: Test Patch Implementation

A strip, 528 metres long on the inside lane on west bound side of the four lane, divided portion of this secondary highway was treated. The test section is located on a straight section with no significant grade. There is a slight camber to the road which causes water to run off, rather than puddle on the road. The asphalt surface on the section treated, was reputedly seven years old (1995 vintage). No significant oil spills were observed, just the occasional drop of transmission oil, crankcase oil or hydraulic fluid. The highway surface was noticeably worn and had about 35-40% of the surface composed of exposed limestone aggregate, with some lateral cracks and rutting due to traffic wear. There was appreciable aging and oxidation of the bitumen, which extended to a depth of two to three mm. The entir 528 metres of the treated highway section was on fill

On August 23, between 8:45 am and 2:30 pm, sixteen segments (panels) were marked off in 33 metre lengths to ensure that the RejuvaSeal™ was applied in a uniform manner. The width of the lane is 3.6 metres between the painted highway centerline and the inside lane marker line. 26.9 litres of RejuvaSeal™ was applied to each of the panels, using paint rollers and paint roller pans, to ensure uniformity in the application. A lunch break was taken at 11.45 am to 2:00 pm. Details of the application are summarized below:

Table 4.3				**Details on RejuvaSeal™ Demonstration Section on Shun-PingGu (S305) Highway**							
Work Schedule	Work Time	No. of Panels	Test Length	Total Area m2	Total Area ft2	RejuvaSeal Applied		Application Rate			
am/pm	(hrs)		(m)		approx	US gals	litres	USGal /ft2	USGal /yd2	Litres /m2	m2 /Litre
8:45–9.45	1.00	3	99	356	3,834	21	79	0.005	0.049	0.22	4.53
9:45–11:45	2.00	10	330	1,188	12,781	69	263	0.005	0.049	0.22	4.53
14.00-14.30	0.50	3	99	356	3,834	21	79	0.005	0.049	0.22	4.53
Totals	3.50	16	528	1,901	20,450	111	420	0.005	0.049	0.22	4.53

The test strip application was completed by 2:30 pm and the lane remained closed until 7:00 pm on August 23, when it was re-opened for traffic. Photos showing the test application of RejuvaSeal™ follow in figures 4.1, 4.2 and 4.3. on the following pages. At 8:00 pm on August 23, a heavy rain started to fall and it lasted until approximately 11.30 pm. The site was visited on August 24 around 10:30 am and the difference was readily perceived between the RejuvaSeal™ treated section and the adjoining untreated portion. Water from the Outflow Meter readily soaked into the untreated portion, whereas water beaded and ran off the treated section
No difference was observed in the skid resistance of the treated section using the Outflow meter.as an indicator.

Figure 4.2: Typical Application Procedure for RejuvaSeal TM

Figure 4.3: Finished Surface - RejuvaSeal TM

4.2 RejuvaSeal Testing

Todate the comparison of the asphalt treated with Rejuvaseal™ has been compared on a subjective basis over a very short period at the test site on the Shun-PingGu highway using the Veeder-Root Outflow meter. In the future, further testing equipment will be brought to the site and a comparison on a more disciplined, objective basis will be undertaken. To this end, the following tests will be undertaken.

- Water Dissipation (Hydroplaning Comparison)
- Fuel Resistance Comparison
- Elasticity/Ductility Testing

4.3 Water Dissipation

An "Outflow Meter" manufactured in the U.S.A. by Veeder-Root and sold under the trademark "Outflow Meter" (see figure 4.4) was used to measure the asphalt pavement's capability to dissipate water, as concern has been expressed about hydroplaning on the RejuvaSeal™ treated surface, versus the untreated surface. The Outflow Meter gives readings in seconds for the dissipation of a known quantity of water. It is suggested that any readings between 3 and 8 seconds are satisfactory results for an asphalt surface, if hydroplaning is to be minimized.

Readings were taken with this aforesaid Outflow Meter at two locations on the portion of the highway selected for the test. The location selected was roughly in the path of the wheels on the drivers side of the vehicle. Initially readings were taken at 9 am on August 23, prior to the application of the RejuvaSeal™, and then the same locations were tested on August 24 at 10:30 am, (i.e. the day following the treatment with RejuvaSeal™) and the results are shown in the table that follows:

Table 4.4		**Veeder-Root Outflow Meter Readings**		
Test	Location relative to centreline	Location relative to overhead sign	Before RejuvaSeal™ (secs)	After RejuvSeal™ (secs)
One	0.8 m north	12.5 m West	7	10
Two	0.8 m north	30.0 m West	9	7

Between these two selected locations an area which had excess bitumen in the asphalt pavement (pavement surface had tar which was soft and smooth) was also tested with the outflow meter and after 22 seconds no measureable amount of water had flowed out of the Outflow meter and the test was abandoned. This is indicative that hydroplaning will be a problem during heavy rains, as water will pond on the immediate road surface

4.4 Fuel Resistance Comparison

Fuel Resistance Comparison will be undertaken on several sections of the untreated and RejuvaSeal™ treated sections in close proximity to the Outflow meter tests in the near future. This comparison will consist of pouring about a cupful of diesel fuel onto the road surface and then later checking the penetration of the fuel. If the fuel readily penetrated the asphalt pavement surface, then resistance to this form of chemical attack was presumed to be lower than if the fuel pooled on the surface of the asphalt pavement and slowly evaporated.

4.5 Elasticity/Ductility Testing

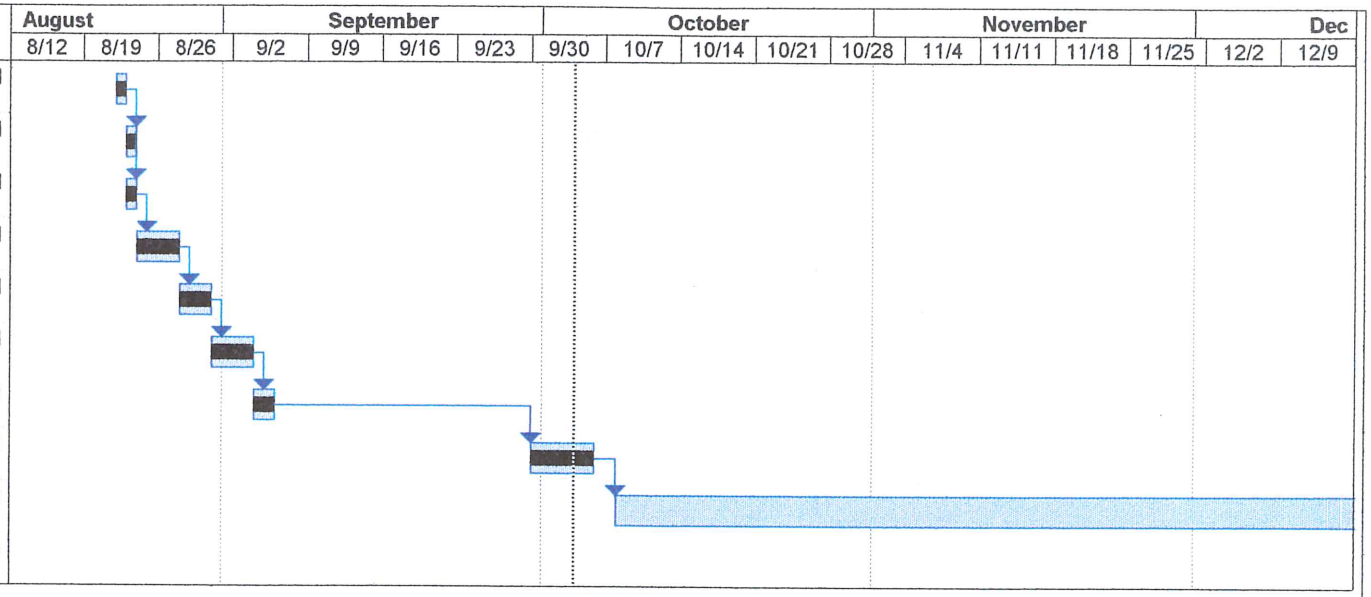
This aspect of the testing is beyond the capabilities of the field equipment available to both Crown Capital Enterprise Limited and RejuvaSeal personnel And as such, external assistance has been sought from outside experts in the field of Asphalt Testing. To this end, Dr John Emery in Toronto, Canada has been contacted for advise on independent testing.

Figure 4.4: Veeder-Root Outflow Meter.

5.0 Test Completion Schedule

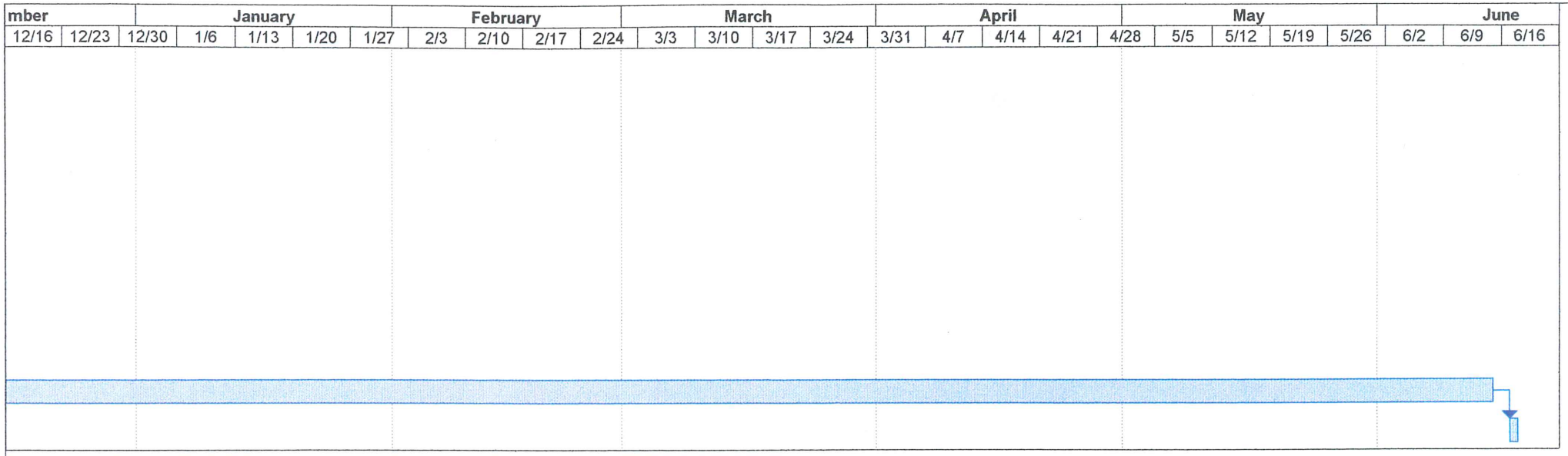
The team of technicians from the Hong Kong office will be dispatched to undertake further testing on the trial section in the near future. The projected completion of this testing is scheduled as shown in the following chart.

ID	Task Name	Duration
1	Travel to Beijing and PingGu	1d
2	Seminar - PingGu	1d
3	Demonstration Section - Shun-PingGu Highway	1d
4	Testing of Asphalt Surface on Shun_PingGu Hwy	2d
5	Travel to other demo's in Xi'an	3d
6	Prepare draft report on RejuvaSeal Demo and Testi	2d
7	Submittal of draft report	2d
8	Prepare and Submit final report	5d
9	Hiatus	180d
10	Visit to site to record status of demo	1d



Project: Beijingsched
Date: Thu 10/4/01

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress



Project: Beijingsched
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Task
Progress
Milestone
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Rolled Up Task
Rolled Up Milestone
Rolled Up Progress

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Lamma, Hong Kong

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Appendix A

Rejuvaseal™ – Technical Seminar,
PingGu, Beijing Municipality
China,
August 23, 2001

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Lamma, Hong Kong

中怡

中怡企业发展有限公司
Crown Capital Enterprise Limited

沥再生 – 技术交流会
RejuvaSeal ™ - Technical Seminar

中国北京
Beijing, China

二零零一年八月二十三日
23 August 2001

Registration and Reception

Introduction

Welcoming Speech

RejuvaSeal ™ – An Introduction

Road Demonstration Projects

Question and Answer Session

Buffet Lunch

CROWN CAPITAL ENTERPRISE LIMITED

WANCHAI, HONG KONG

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August 2001

Appendix B

Rejuvaseal™ Descriptive Literature

TS² Consulting Inc.
Lamma, Hong Kong

CROWN CAPITAL ENTERPRISE LIMITED
中 怡 企 業 發 展 有 限 公 司

RejuvaSeal™ 沥再生

Asphalt Pavement Rejuvenator
沥青路面再生密封剂

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May 2001

沥再生 RejuvaSeal™

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6.0 Qualifications

STATEMENT OF QUALIFICATIONS

I, Anthony G. Speed of Hong Kong in the Special Administrative Region of China, DO HEREBY CERTIFY.

I. THAT I am a Consulting Engineer, with offices at 2/F, 81 Po Wah Yuen, Lamma Island, Hong Kong

II. THAT I am a 1968 graduate of the University of Saskatchewan, Canada with a Bachelor of Science Degree in Mining Engineering.

III. THAT I am currently registered and in good standing as a Professional Engineer with the Association of Professional Engineers of Ontario, and New Brunswick, Canada

IV. THAT my 30 years of continuous experience in mining, major civil engineering works (earth moving, highway and mining construction) has exposed me to a broad knowledge of mining and heavy civil engineering construction and allowed considerable familiarization with road construction and asphalt pavement.

V. THAT this report is based on my visit on August 22, 23 and 24, 2001 to PingGu, Beijing Municipality, China and participation in the test work described in this report

Dated at Hong Kong, this 30th day of September, 2001

Anthony G. Speed, P.Eng.