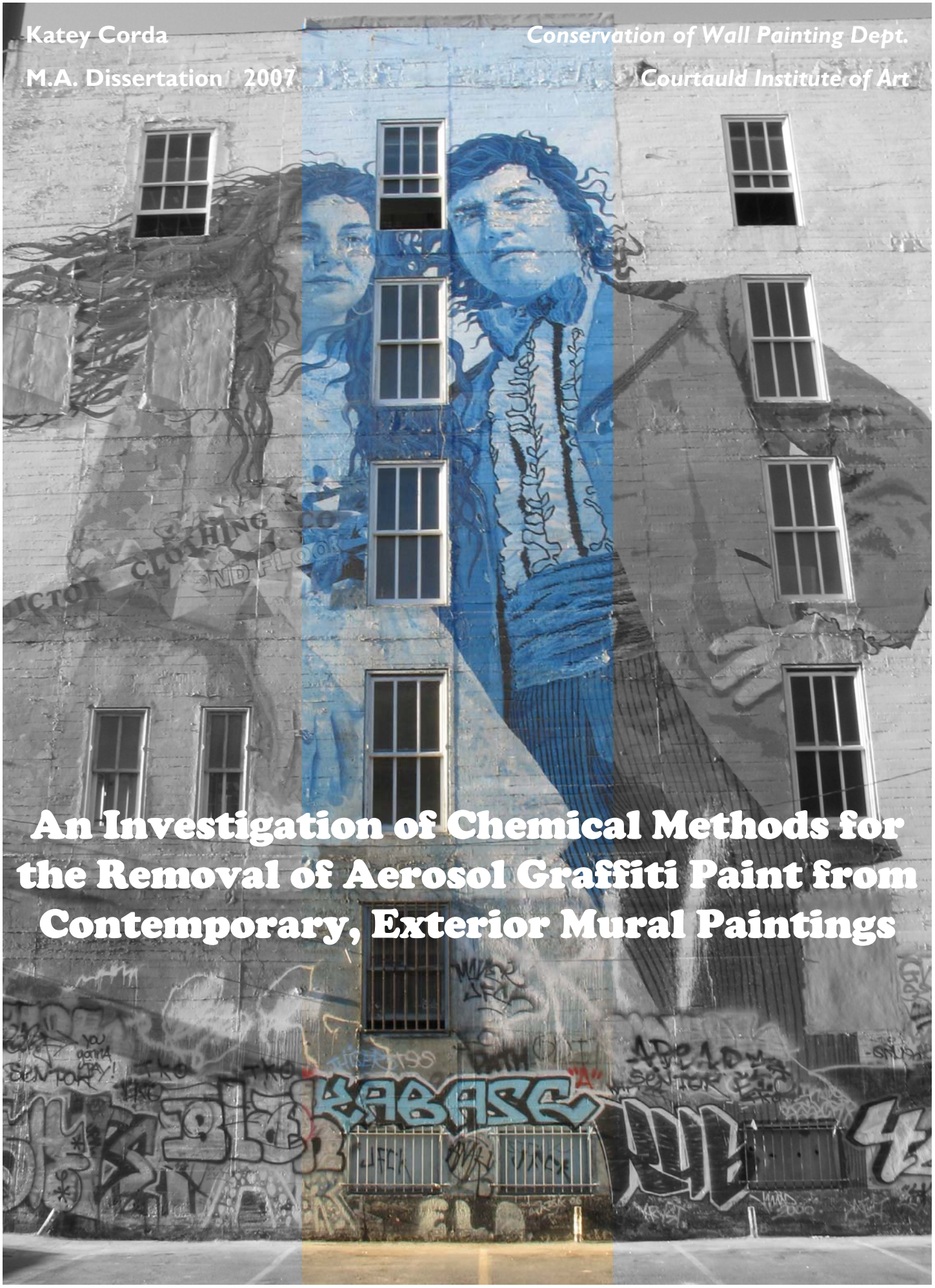
Katey Corda
M.A. Dissertation 2007
*Conservation of Wall Painting Dept.*
*Courtauld Institute of Art*




# An Investigation of Chemical Methods for the Removal of Aerosol Graffiti Paint from Contemporary, Exterior Mural Paintings

**This research was sponsored by English Heritage and was undertaken as part of an overall collaboration between English Heritage and the Courtauld Institute of Art**

*Conservation of Wall Painting Department*

**COURTAULD INSTITUTE OF ART**

Somerset House, Strand, London WC2R 0RN
Telephone +44 (0)20 7848-2777
www.courtauld.ac.uk

# Summary

The wide production of external mural paintings is a fairly recent phenomenon which exploded particularly in the United States in the late 1960s and has come to be known as the *Contemporary Mural Movement*. Such murals cover a vast range of exterior surfaces including the walls of public, private, and commercial buildings, freeways, parking structures, and even water channels. Many of the murals began as community outreach programs and were intended not only for the beautification of city neighbourhoods, but to serve as landmarks of cultural heritages often left out of mainstream education. For this reason, their significance is considered in terms of public pride and sentiment rather than in monetary value.

Unfortunately, because of their exterior, urban locations and lack of security, murals have become targets for *tagging*, or graffiti defacement, most commonly implemented with the use of aerosol spray paints. Currently, methods of graffiti paint removal from polychrome surfaces are underdeveloped and often result in severe damage to the original paint materials as, for example, commonly occurs with the use of proprietary graffiti removal products and standard paint strippers.

The current study has aimed to assess the problem of aerosol graffiti on contemporary mural paintings and evaluate the potential for its safe removal through the implementation of solvent-based cleaning trials. Application parameters of cleaning systems, including the use of auxiliary materials, were considered instrumental to the success of the trials and were likewise investigated for this purpose. The criteria for the intervention of graffiti removal with regard to both performance characteristic criteria and working property criteria are first outlined. Investigations and cleaning trials which formed the foundation of the study were carried out on four contemporary murals located in Los Angeles, California, which included Kent Twitchell's *The Bride and Groom*, Judith Von Euer's *Flow Inversion*, Janet Sellers' and James Garcia's joint mural located in Elysian Park, and Peter Quezada's *Untitled* mural on North Figueroa Street. In addition to the use of known solvent systems, cleaning trials were carried out with selected proprietary graffiti-removal products so the results of the different systems could be compared.

The results of cleaning were evaluated though on-site techniques of assessment including rigorous visual examination and macro/raking light imaging, while *ex-situ* evaluation techniques included cross-section microscopy and scanning electron microscopy. Limited identification of added paint materials was undertaken with the use of FTIR and PyGCMS analytical techniques. Analysis was intended to establish a range of materials which might typically be encountered in the context of the intervention and aid in an attempt to characterize the cleaning responses of the various materials.

In each of the case studies it was not possible to develop an ideal cleaning system for the removal of aerosol graffiti from the murals' surfaces. However, in every case the results of the developed cleaning systems were found to greatly improve upon results obtained with the use of proprietary graffiti-removal products.

# Contents

# Acknowledgments

This study was sponsored by English Heritage and was undertaken as part of an overall collaboration with the Courtauld Institute. I am particularly grateful to Robert Gowing (Senior Wall Painting Conservator, Building Conservation and Research Team) for his encouragement and for providing numerous sources of information. For suggesting this research topic and for sharing her considerable experience I would like to thank Leslie Rainer (Senior Project Specialist, Getty Conservation Institute) who also kindly provided products for testing during preliminary and on-site cleaning trials.

The *in situ* trials for this study would not have been possible without the generous help of a large number of professionals. The Getty Conservation Institute (GCI), which has a long record of advocacy, study and conservation of the modern murals of Los Angeles, was instrumental in facilitating this research by providing expertise, analytical facilities and information resources. I am particularly indebted to Timothy Whalen (Director of the GCI), who took an early interest in the topic and extended the considerable resources of the Institute. Dr Giacomo Chiari (Chief Scientist, GCI) very generously provided access to facilities and a welcome base from which to work. I owe a particular debt to Alan Phenix (Museum Research Lab, GCI) who, with characteristic generosity, shared his time and considerable expert knowledge of solvents and approaches to their testing for the successful implementation of cleaning trials. For undertaking organic analysis of a number of aerosol graffiti paint samples, which was instrumental to understanding the range of the added materials and therefore the overall graffiti problem, I am extremely grateful to Dr Tom Learner and his colleagues Herant Khanjian and Rachael Rivenc (Science, GCI). Many thanks are due to Mark Leonard (Head of Paintings Conservation, Getty Museum) for providing laboratory space and materials for preliminary *ex-situ* solubility testing, and to Laura Rivers for her patient help in the paintings conservation studio during this process. David Carson (Science, GCI) kindly provided invaluable training in the use of the SEM. Finally, I would like to thank Gary Mattison (Department Coordinator, Science), for his general guidance and for deftly smoothing away problems during my time at the Getty.

I have been exceptionally privileged to carry out cleaning trials on some of Los Angeles' most notable mural paintings. This would not have been possible without the collaboration of various individuals responsible for the sites. To Pat Gomez, Arts Development Fee & Murals Manager, and Zina Hwang, both of the Los Angeles Cultural Affairs Department for their enthusiasm and commitment in all aspects of the project. I am extremely grateful for their advice and guidance in the selection of potential case studies, for putting me in contact with a number of artists and authorities in the Los Angeles area, and for their help in gaining access to paintings on city properties. Likewise, Vincent Moreno (Caltrans' District 7 Adopt-a-Highway Coordinator) played a significant role in providing permission for my work on the *Flow Inversion* mural painting. The involvement of the artists of each case study was similarly crucial to the completion of the project trials. Many thanks are owed to Peter Quezada, Kent Twitchell, Janet Lee Sellers, and Judith Von Euer for allowing me to carry out trials on their paintings and for taking the time to speak with me and provide a magnitude of information on the painting technology and history of their works.

At the Courtauld Institute, my supervisor Sharon Cather has been invaluable in her help with all aspects of the investigations. Many thanks are owed to her for her expertise and guidance while on site in Los Angeles, and her vast contribution to the development of the

study off site. The investigations have likewise benefited greatly from the help of Charlotte Martin de Fonjaudran, Private Conservator. My deepest gratitude is owed to her for coming to Los Angeles where she provided endless insight and encouragement with regard to on site trails. Trials, with particular reference to *The Bride and Groom* mural painting, were also greatly enhanced by the enthusiastic visit and input of Mr. V.C. 'Bud' Jenkins (Chemistry Instructor, Paint and Coatings Institute, California Polytechnic, Pomona). I am very appreciative to him for imparting his immense knowledge of paint and coatings to me.

Analysis of the cleaning trials carried out benefited from access to SEM at the Institute of Archaeology in London. I am particularly grateful to Kevin Reeves for making this equipment available and for his assistance in its use. The written account of this study was likewise enhanced immeasurably by the wonderful images of the Ernest Long archive. I would like to thank him for his appreciation of the Los Angeles murals and, not only for sharing his images with me, but for making them available for use in this document. On the same note, I would like to thank Rand Epich for digitizing the archive and providing it to me.

Finally I would like to thank my family; particularly my mother, Claudia DiAndrea, my father, Stanley Corda, and my sister, Carley Corda. Without their endless encouragement, guidance, and support (financial and otherwise), completion of this project would not have been possible. Further thanks are due to my mother for invaluable logistical help, and to my father for ensuring my mobility in Los Angeles. Lastly, I am exceedingly grateful to *the crew* at the Courtauld: Kiernan Graves, Naoto Kakumoto, Jennifer Porter, Giovanni Verri, and Polly Westlake, and would like to thank them for their encouragement, support, contribution of ideas to this project, and most importantly, for their friendship over the past three years.

# Section 1: Introduction

Thousands of contemporary external mural paintings exist in cities around the world. Los Angeles alone, known to some as 'the mural capital of the world' (Rainer *et al.* 2002: 107), has between 1,500 and 5,000 murals (depending on how they are counted) (Baca 2002: 22). They can be found in any number of locations including the walls of buildings, car parks, freeways, parks, tunnels, retaining walls, temporary construction sites, and many other sites (*Figures 1.1 to 1.5*). Unfortunately, because of their outdoor urban locations and city maintenance policies, murals have increasingly become a target for graffiti vandalism. The aim of this study is to assess the problem of painted graffiti on contemporary mural paintings and evaluate the potential for its safe removal through chemical cleaning methods.

## *1.1 The Graffiti Problem*

### 1.1.1 Definition

*Graffiti*, from the Italian word 'graffiare' meaning 'to scratch', are defined as 'inscriptions or drawings scribbled, scratched, or sprayed on a surface, originally as inscribed on ancient walls' (Thompson 1995: 589) (*Figure 1.6*). Graffiti can be created with a range of materials, most notably spray paint, but also including brush-applied paint, felt-tip marker, ballpoint pen, chalk, graphite and coloured pencil, pastel, wax, oil, crayon, lipstick, adhesive labels, open flame, scratching tools, etc (Historic Scotland 2005: 6; English Heritage 1999: 2; Weaver 1995: 2). When graffiti are applied to a surface without the property owner's consent – as most commonly occurs – the act is a form of vandalism and a crime punishable by law in most countries (wikipedia.org/Graffiti 2007).

Graffiti should be distinguished from other forms of vandalism and defacement such as *iconoclasm*. 'Iconoclasm is the deliberate destruction within a culture of the culture's own religious icons and other symbols or monuments, usually for religious or political motives…It is thus generally distinguished from the destruction by one culture of the images of another' (wikipedia.org/Iconoclasm 2007).

### 1.1.2 Context

#### *Historical context*

Graffiti have been in existence for thousands of years, perhaps since the beginning of human society. Some consider the paleolithic markings and drawings on the walls of the Lascaux caves in France to be graffiti (Whitford 1992: 2). But certainly, true graffiti as they are thought of today, have been identified on ancient Egyptian monuments, the city walls and buildings of Pompeii (*Figures 1.6 to 1.8*), the Mayan archaeological site of Tikal in Guatemala, and many other historic sites throughout the world (Whitford 1992: 2; wikipedia.org/Graffiti 2007). Entire studies have been devoted to historic graffiti such as those commonly encountered on English medieval buildings (Pritchard 1967) (*Figures 1.9 and 1.10*). Most often, these historic graffiti exist today in the form of scratches in hard surfaces. Markings in other media may well have existed also, but perhaps are not as readily encountered today due to the impermanence of the media with which they were created.

Ancient graffiti of this type can provide important historic evidence and information about the people and cultures by and in which the markings were created. For example, errors in spelling and grammar found in ancient Roman graffiti provide clues about the pronunciation

of spoken Latin and the level of common literacy within the civilization (wikipedia.org/Graffiti 2007).

Although commonly used as a form of political activism and by street gangs to make territorial statements up until the 1960s, graffiti in the contemporary sense of the word consist of two main forms: *tagging* and *graffiti art* (Obiospo 2007). It is now commonly agreed that graffiti 'tagging' – the illegal and repetitive scrawling of names and nicknames on public surfaces (Dunitz 1993: 17) – was developed on the streets of Philadelphia by two men, *Cool Earl* and *Cornbread* who are considered responsible for the first true graffiti *bombing* in the late 1960s (Obiospo 2007). In the beginning of the 1970s, the centre of graffiti culture shifted from Philadelphia to New York City where it underwent an enormous surge in the development of style and popularity as it became publicized in the media for the first time. The publicity and fame achieved by a few taggers at this time encouraged more and more youth to begin tagging. As competition grew, taggers began developing more unique graffiti pieces to distinguish themselves. Tags became larger, new styles of script were created, design elements were added to the pieces, and suddenly the graffiti became recognized for their artistic merit – thus the development of 'graffiti art' (Ancelet 2006; Dunitz 1993:17) (*Figures 1.11 and 1.12*).

#### *International context*

Since the development of modern graffiti in the 1960s the presence of graffiti have dramatically increased throughout the world. Although evidence shows that graffiti has been prevalent on a far-reaching scale since ancient times, the development of tagging and graffiti art in the Unites States, and the development of graffiti-friendly materials such as aerosol paints have led to a significant increase in the popularity and volume of tagging everywhere. Graffiti are today classified as a major worldwide contemporary urban problem.

#### *Development of graffiti culture in Los Angeles*

In Los Angeles prior to the 1980s, the existence of graffiti was mainly confined to limited gang-related markings, mostly intended as territorial designations. Tagging culture is thought to have diffused in LA through popularization in the media: magazines, books, and films. Since then, LA has been overwhelmed by hierarchical groups or clans of taggers which are entirely unrelated to the gang system and produce a majority of the graffiti in existence (*PC* Quezada 2007; Whitford 1992: 3) (*Figures 1.13 to 1.15*).

#### *Graffiti versus art*

It is not within the scope of this project to distinguish between graffiti as a nuisance or an important art form in their own right. Opinions on this subject vary wildly. In the context of this project, graffiti were only removed when obscuring the surface of a mural with previously recognized significance.

### 1.1.3 Reasons for mural tagging

Surfaces are vandalized with graffiti for a number of reasons: as a means of personal expression, a designation of territory, a means of outdoing or covering the work of a rival tagger, etc. More frequently however, this vandalism is spreading from drawing on a blank wall to covering an existing work of art, or mural. A few hypothetical causes for this increased defacement of wall paintings can be identified (*PC* Baca 2007; *PC* Estrada 2006; *PC* Rainer 2007).

- Cities and authorities have come to realize that the key to graffiti elimination is removing them as soon as they appear (ideally within twenty-four hours of their application) (Weaver 1995: 1). Removal is typically quickly and easily implemented by covering with a solid paint layer. Due to the relatively recent passage of laws such as the Visual Artists Rights Act (VARA) and the California Art Preservation Act (CAPA), maintenance crews typically cannot paint out graffiti covering the surface of a painting. Therefore, graffitists know that a tag on a mural will be visible for far longer than if they paint on a blank wall.
- Mural paintings tend to be situated in areas of high visibility and if taggers paint on top of the mural their marks will likewise have a high level of visibility.
- At times murals are vandalized because the graffitists prefer their 'art' to the existing work.
- Due to a recent decline in government-funded mural programs, such as the *Social and Public Art Resource Center's (SPARC) Citywide Mural Program*, fewer community murals involving the local youth are being created. Without involvement, new generations do not tend to develop a respect for the murals in their community.

## *1.2 Consequences of Graffiti*

### 1.2.1 Current approaches to graffiti on painted surfaces

Currently several different approaches are taken to deal with graffiti on wall paintings in Los Angeles (*PC* Quezada 2007; *PC* Rainer 2007; *PC* Moreno 2006; *PC* Twitchell 2006):

- *Abstain from action* – Perhaps most commonly when graffiti are encountered on a mural surface, no action is taken to either remove or cover them.
- *Over-painting* – Depending on the mural and the maintenance crew in charge of dealing with them, graffiti found on a painting will be covered with a solid paint layer (*Figures 1.16 and 1.17*). This is done to deter the application of additional graffiti to the surface. Furthermore, it is a much cheaper and easier means of concealing the graffiti than removal. Usually, only the section of mural with the graffiti will be painted out; however, if the graffiti are particularly extensive the entire mural may be painted over.
- *Cleaning* – Graffiti removal may be undertaken by either a conservator or a non-specialist. However, in either case it is most often undertaken with the use of proprietary graffiti removal products (Rainer *et al.* 2002: 110) which often cause severe damage to the original painting (*Figures 1.18 to 1.22*).
- *Retouching* – Often the original artist of the mural will simply repaint sections which have been tagged. Conservators will often retouch the painting also, typically after cleaning the graffiti from the surface. Artist and conservator may work together to restore the painting in some situations.
- *Destruction* – in extreme cases of graffiti attacks on a painting, the entire mural has been destroyed.

### 1.2.2 Damage

Graffiti is damaging to mural paintings whenever removal of that graffiti is undertaken. Currently, there are no safe methods of removal which will not cause some (if not

extensive) damage to the original painting.[1] However, if the graffiti are not removed, additional graffiti are likely to appear on the mural surface (Rainer 2003: 6) which can lead to the painting out of sections or the whole painting and even complete destruction of the mural all together.

### 1.2.3 Expense

Costs for the removal of graffiti increase each year. Although costs for removal worldwide are obviously not available, it is estimated that tens of billions of dollars are spent each year. Local costs for removal are more definitive. 'A 2002 survey of communities conducted by Public Technology, Inc., found that "Los Angeles County spends about $55 million per year on graffiti removal" ' (graffitihurts.org 2007).

### 1.2.4 Legal and ethical consequences

The painting out or destruction of a mural, often due to repeated attacks of vandalism, can have serious legal consequences for those who implement the action. Two important acts exist, one of the US federal government and one of California State, which serve to protect works of art. The California Art Preservation Act (CAPA)[2] (sfartscommission.org 2007) was the first to be instated as legislation in 1979. Approximately eleven years later in 1990 a federal law was instated, known as the Visual Artists Rights Act (VARA), to protect the works of artists throughout the US[3]. The passage of the VARA provided, among other rights, the 'right of integrity', which entitles artists to protect their works from modification or destruction by imposing 'a legal liability for those who destroy, alter, or mutilate a mural and requires conservators to preserve the artistic intent of the artist' (Garfinkle 2003: 4). The act applies only to living artists. Typically VARA, as federal law, takes precedence over CAPA state law except in the case of the artist's death since the rights appointed to artists by CAPA are valid for fifty years following death (Garfinkle 2003: 11).

Under these two pieces of legislation a number of artists have been able to legally hold another party liable for damage to their murals. Recently, artist Kent Twitchell filed a lawsuit for 5.5 million dollars against the YWCA (Young Women's Christian Association) and several contractors when his mural, *Ed Ruscha Monument*, was painted over during renovations to the Downtown building on which it was located (Maese 2007: 1) (*Figures 1.23 to 1.25*). The suit contends that the painting was 'wilfully and intentionally desecrated, distorted, mutilated and otherwise modified' (Haithman 2006).

---

[1] The results of the current project, investigating the removal of painted graffiti, have shown that some damage to the original material is always caused by removal. This is primarily due to the chemical similarity of the two, and the typically deteriorated condition of the original. See section 11.2 for further details.

[2] Refer to http://www.sfartscommission.org/pubart/about_us/policies_guidelines/capa.htm to review the full act as stated in legislation.

[3] Refer to http://en.wikipedia.org/wiki/Visual_Artists_Rights_Act and Garfinkle 2003: 4.

**Figure 1.1:** *'Chicano Park Murals' by various artists, 1973-77, located on the Coronado Bridge in San Diego, California.* **Photo: E. Long 1973.**

**Figure 1.2:** *'Horizon Rising', artist and date unknown, Los Angeles, California.* **Photo: E. Long 1974.**

**Figure 1.3:** *Untitled murals by the residents of St. Elmo's Village, on-going since the 1970s, 4830 St. Elmo Drive, St. Elmo's Village in Los Angeles, California.* **Photo: E. Long.**

**Figure 1.4:** *Untitled mural, artist and date unknown, on the garage door of a private residence at the northwest corner of main and Hollister in Venice, California.* **Photo: E. Long 1973.**


**Figure 1.5:** *Untitled murals, artist unknown, 1974, on the exterior temporary wall surrounding a construction site at Valencia and 7th St., Los Angeles, California.* **Photo: E. Long 1974.**

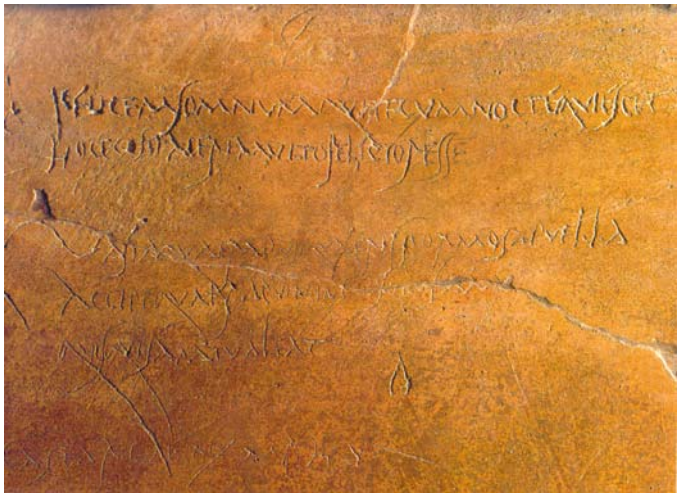


**Figure 1.6 (above):** *Fragment of wall with graffiti from the House of Fabius Rufus, Pompeii, Italy. 'The fragment exemplifies the extreme variety of epigraphy of Pompeian walls. In dense concentration, on a few square centimeters of wall, are written eleven graffiti of different types by different hands (Franchi dell'Orto & Varone 1992: 153).* **Photo: Franchi dell'Orto & Varone 1992.**

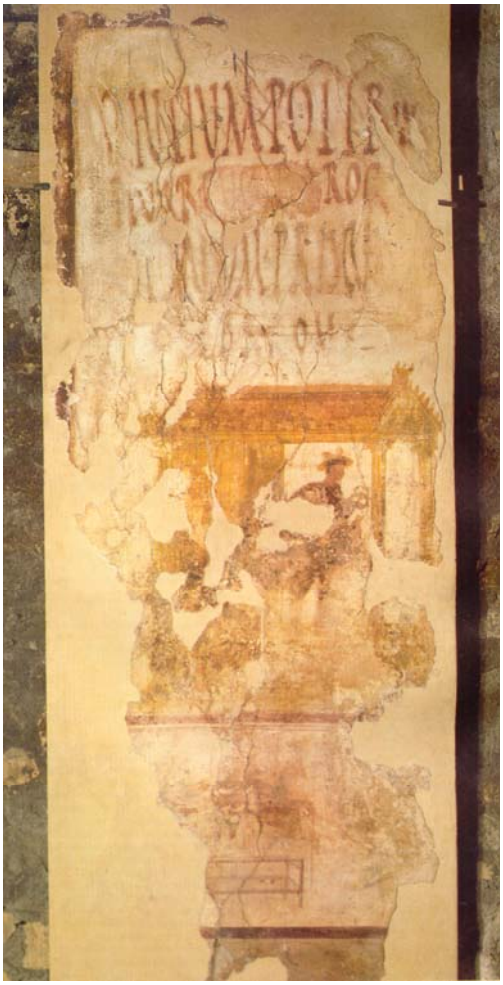


**Figure 1.7 (top right):** *Fragment of a wall painting detached from the façade of the 'coactiliaria' workshop of Verecundus in Pompeii. The fragment contains two graffitied passages, known to be electoral inscriptions.* **Photo: Franchi dell'Orto & Varone 1992.**

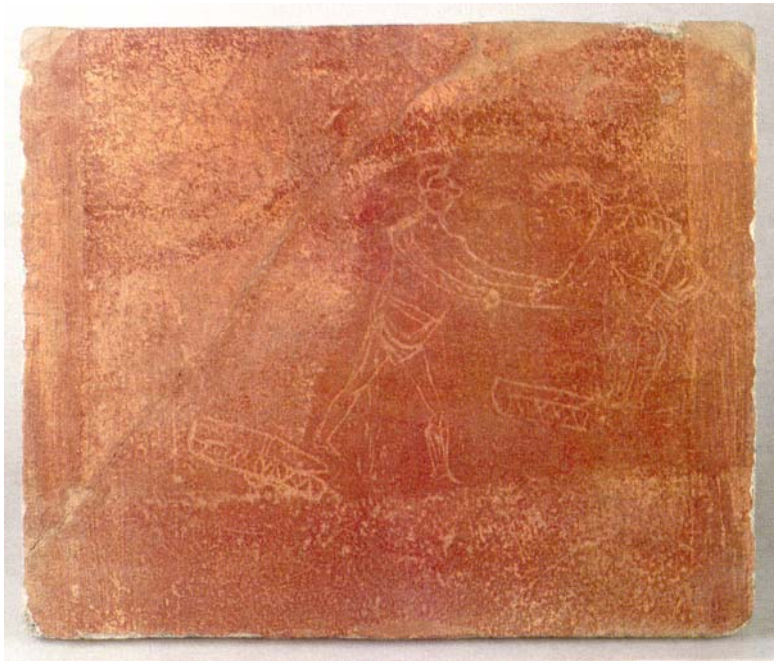


**Figure 1.8 (left):** *Fragment of a wall from Pompeii with graffito depicting two gladiators in a scene of hand-to-hand combat.* **Photo: Franchi dell'Orto & Varone 1992.**

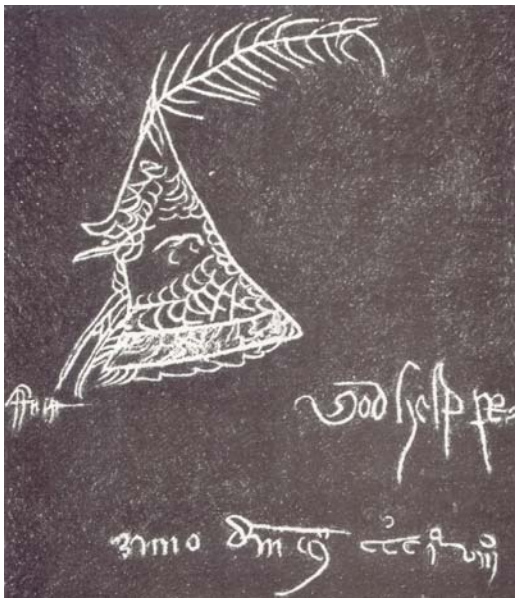


**Figure 1.9 (right):** *Rubbing of graffito from the aisle of All Saints Church in Goxhill, England, probably dating from the fifteenth century. The image depicts a knight with sword.* **Photo: Pritchard 1967.**

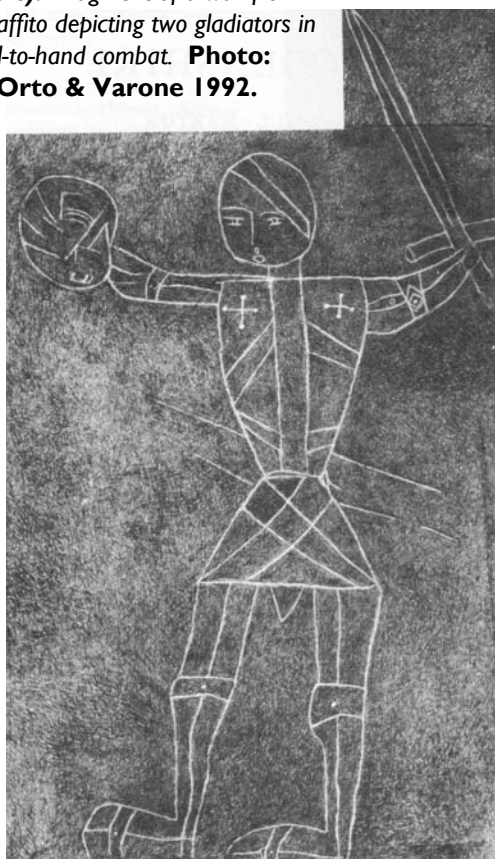


**Figure 1.10 (above):** *Rubbing of graffito from the Church of St Mary the Virgin in Steetle Bumpstead, England, dating from 1301 A.D.. The graffiti shows an image of a hat with a tall feather and contains the inscription 'God help me', followed by the date.* **Photo: Pritchard 1967.**

**Figure 1.11 (left):** *'Color Shower', artist and date unknown. An example of graffiti art in Los Angeles.* **Photo: Ancelet 2006.**

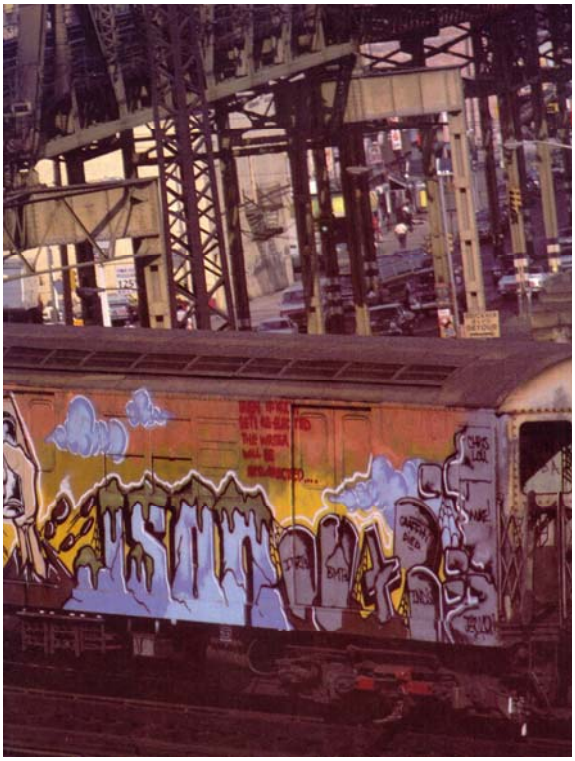
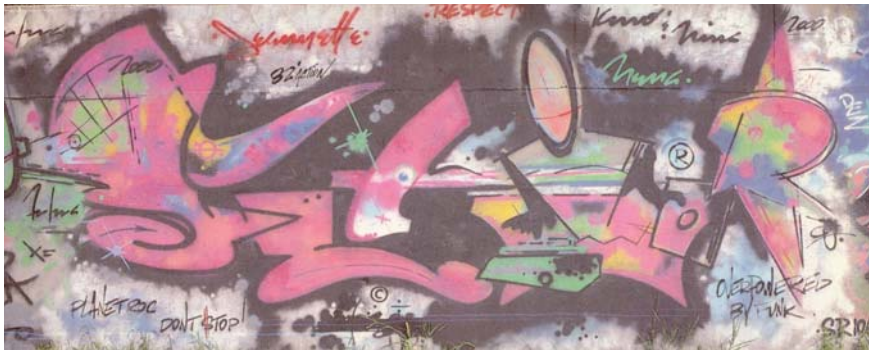


**Figure 1.12 (above):** *Whole car by Seen and JSon, 1982, location unknown. An example of graffiti art covering an entire train car.* **Photo: M. Cooper.**



**Figures 1.13 (above left) and 1.14 (below):** *(Above left) 'Futura 2000 mural' by unknown artist, 1982, at Graffiti Hall of Fame (a schoolyard at Park Avenue and 106th Street), Harlem, New York. (Below) Untitled by unknown artist, 2006, Venice Beach, California. Highly stylized and intricate graffiti 'tags' like those pictured here are common throughout Los Angeles. This type of graffiti is typically unique to tagging culture and unrelated to the gang system.* **Photo: (above) A. Schwartzman 1985; (below) Courtauld Institute CWPD 2006.**

**Figure 1.15 (left):** *Venice Beach, California. The image shows two graffiti artists at work painting on one of three walls in Los Angeles where graffiti painting is legal.* **Photo: Courtauld Institute CWPD 2006.**

**Figures 1.16 (above) and 1.17 (below):** *'Title', date and artist unknown, located on the interior of the bandstand at McArthur Park in Downtown Los Angeles, California. The image above depicts the mural as it appeared when it was first painted and in good condition, while the image below depicts the same mural at a later date. In the lower image, the vast majority of the mural has been painted out with a solid layer of paint due to repeated attacks of graffiti vandalism.* **Photos: E. Long 1973 (above) and 1980 (below).**


**Figure 1.18:** *'The Pope of Broadway' by Eloy Torrez, 1985, located on the Victor Clothing Co. Building at 240 S. Broadway in Downtown Los Angeles, California. Overall view of the mural.* **Photo: Courtauld Institute CWPD 2007.**

**Figures 1.19 (above) and 1.20 (left):** *Torrez's mural has suffered from graffiti attacks and subsequent cleaning attempts which have left the lower portion of the original paint layer severely damaged and muddled (above). The damage is particularly evident when the lower section of the painting is compared to a detail of the upper section which graffiti has not affected (left).* **Photos: Courtauld Institute CWPD 2007.**

**Figures 1.21 (above left) and 1.22 (above right):** *Detail of the damage caused to the original paint layer by a poorly implemented attempt at graffiti removal.* **Photos: Courtauld Institute CWPD 2007.**

**Figure 1.23:** *'Ed Ruscha Monument' by Kent Twitchell, 1978-87, located on the exterior of the Job Corps Center at 1031 S. Hill St. in Downtown Los Angeles, California. The above image depicts the mural as it originally appeared.* **Photo: R. Puchalsky 2000.**

**Figures 1.24 (above left) and 1.25 (above right):** *The two images show the mural, 'Ed Ruscha Monument', as it appeared a few months prior to being painted out in June of 2006 (above left) and as it appears currently (above right).* **Photos: P. Schmelzer 2006.**

# Section 2: Contemporary Mural Paintings

## *2.1 The Murals*

The wall paintings reviewed and discussed within this project can be classified as contemporary, exterior mural paintings. The term *contemporary*, with regards to art, refers generally to the art of today and typically includes all art produced from the late 1960s to the present (Wikipedia.org/Contemporaryart 2007). The wide production of contemporary outdoor mural paintings is a relatively recent phenomenon which exploded across the United States in the late 1960s and is now known as the *community mural movement*. The movement grew out of a long tradition of mural painting in the US, which began in the 19th century with the work of artists such as John Singer Sargent (Rainer 2003: 4). Mural painting continued to be an important aspect of US art history into the 20th century, and was politicized in the US by the works of the Mexican muralists such as Diego Rivera (*Figure 2.2*) and David Alfaro Siqueiros. In the 1930s, the US government established the *Federal Arts Project* under the *Work Projects Administration* (WPA) through which it encouraged and employed artists to paint industrial and agricultural mural scenes on many public buildings (Columbia Electronic Encyclopeida 2007) (*Figures 2.3 and 2.4*).

A large majority of the murals produced during the community mural movement began as community outreach programs (*Figures 2.5 and 2.6*) and were created not only for the purpose of neighbourhood beautification, but as a means of recording the histories of those people and events 'otherwise largely neglected in mainstream education' (Rainer 2003: 4) (*Figures 2.7 to 2.9*). It is this history which makes the murals significant beyond traditional artistic terms.

## *2.2 The Patrons/Sponsors*

Community murals evolved differently from traditional wall paintings which were typically commissioned by a private individual or body (e.g. the Church). These bodies commissioned paintings of their choice to represent their individual agenda. Although some of the murals created during this period did evolve in the traditional manner, a majority found other routes of development:

- Government sponsorship (e.g. the LA City mural programme; Caltrans mural programme);
- Sponsorship from non-profit organizations (e.g. SPARC mural programme);
- No sponsorship – many of the artists produced murals without the assistance of funding from an outside organization (e.g. the works of Peter Quezada).

Significant non-governmental funding for murals helped to ensure that the production of public artworks could not be controlled or censored by public authorities (Baca 2002: 21).

## *2.3 Significance*

The significance of a community mural can be extremely difficult to assess since murals are not portable objects and cannot be purchased and sold as easel painting can. 'Their value needs be calculated differently than in solely monetary or physical terms' (Drescher 2003: 6). There is some consensus regarding appropriate criteria for assessing the significance of these murals (Drescher 2003: 6; Baca 2002: 23):

- community sentiments (the desires of the mural's daily audience);
- desires of the individuals whose interests the mural represents;
- historical significance;
- mural art history;
- aesthetics; and
- the artist's oeuvre.

## *2.4 Painting Technology*

Due to the vast range of materials available and the common use of experimental techniques, the technology of contemporary mural paintings varies hugely. Only general similarities and aspects of technology will therefore be briefly discussed below.

### 2.4.1 Support

Contemporary mural paintings are located throughout cities, on a vast array of surfaces. Typically they are not conceived of as integral to the architecture of the building or surface on which they are located and were instead executed on the building materials already in place. Their support systems therefore are wide-ranging and include brick, stone, wood, cinder block, etc. The most common material used in modern construction is Portland-cement based concrete of various types (Mindess *et al.* 2002). Therefore a majority of contemporary murals have concrete supports.

### 2.4.2 Render

Depending on the support material, a render layer – often lime-based – may be present between painting and support. However, more often than not (and particularly true with concrete supports) the painting is executed directly on the support surface.

### 2.4.3 Surface preparation

Surface preparation for contemporary murals is often minimal but generally consists of superficial cleaning of the support, which will often have been in existence for years prior to the creation of a painting on it. A solid base layer of light-coloured paint or acrylic 'gesso' is then commonly applied to the support or render to prepare the surface for painting (*Figures 2.10 and 2.11*). Acrylic *gesso* is a modern synthetic version of the traditional gesso priming material which was composed of powdered gypsum (or occasionally calcium carbonate) in an animal glue binder. Today the modern material is created from a mixture of calcium carbonate and pigment (often titanium dioxide) in an acrylic polymer medium (wikipedia.org/Gesso 2007).

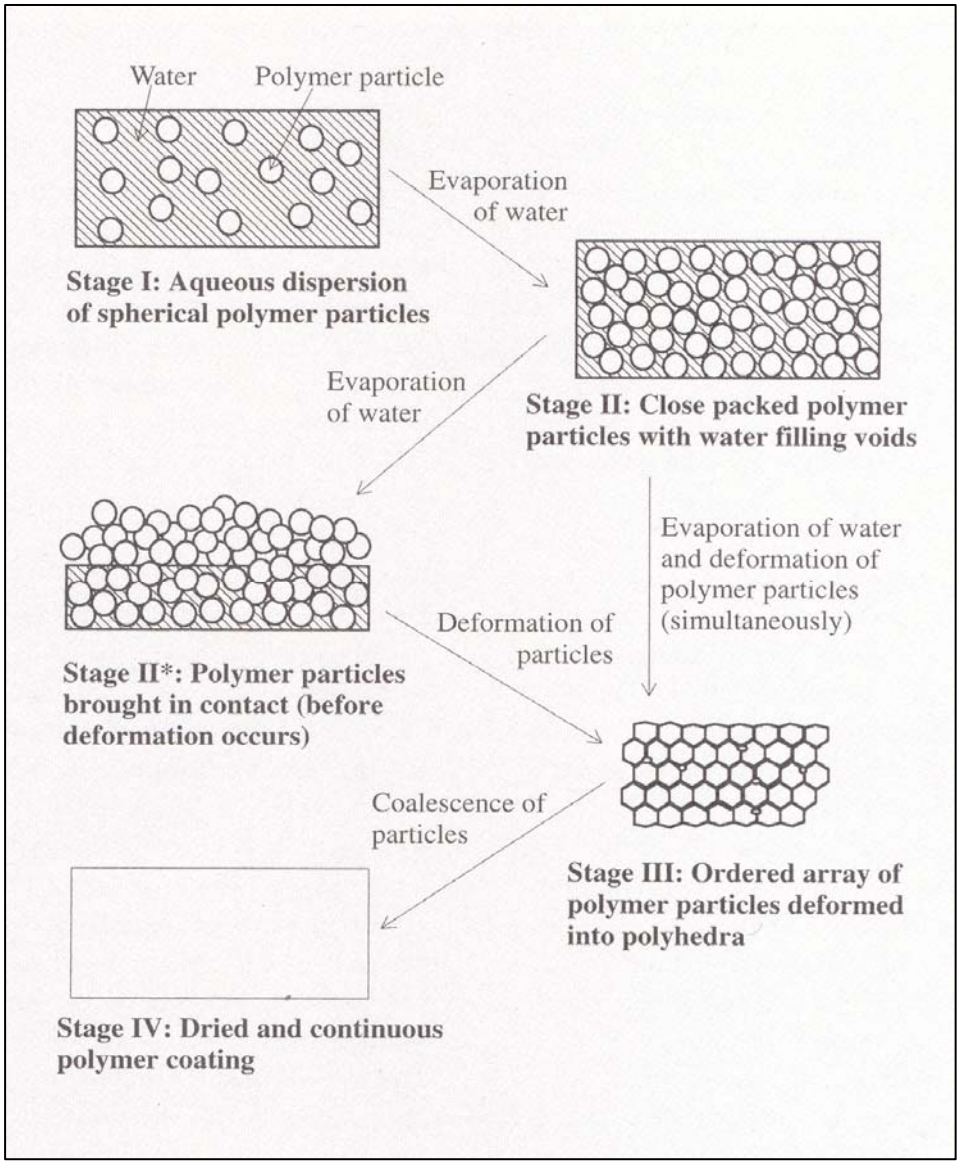
### 2.4.4 Modern paint materials

'It is fair to say that the early murals were done with a hearty dose of testosterone; the founding fathers believed that the best way for a mural to last was to make it with the strongest, hardest oil-based paint available' (Pounds 2003: 8). However, with the development of industrial paints based on synthetic resin binding media in the early 20th century, artists soon realized that permeability is preferable to a powerful sealing of the wall (Pounds 2003: 8) (*Figure 2.13*). Modern synthetic paints afforded artists this advantage and others: the paints are fast drying, relatively cheap, generally miscible with water, easy to mix and use, display excellent physical properties upon drying. Murals have since been predominantly painted with synthetic resin paints (*Figure 2.12*).

### *Acrylic resins*

The four most important classes of synthetic resin binders used widely in the production of twentieth-century paints include acrylic resin, alkyd resin, polyvinyl acetate (PVAc), and nitro-cellulose (pyroxylin) (Learner 2004: 1; Crook & Learner 2000: 12). Of these, the acrylic resins – solutions and dispersions – are the most commonly used by artists.[4] They are composed of acrylic polymer particles, respectively dissolved in an appropriate organic solvent or suspended in water. A number of additives is included in the formula (such as dispersants, surfactants, anti-foaming agents) to enhance the physical properties of the material.[5] The paint film forms by evaporation of the respective solvent or dispersant, causing deformation and coalescence of the polymer particles into a continuous, dried polymer film (Learner 2004: 14) (*Figure 2.1*).

*Figure 2.1: 'Theoretical mechanisms for film formation in an emulsion system (after Keddie et al. 1995), showing two alternative pathways (either via Stage II or not) and producing an ideal homogeneous film' (Learner 2004: 14).*




[4] Although incorrectly termed *acrylic emulsions*, they are technically *dispersions* (Learner 2004: 9).

[5] For an in-depth discussion of the additives in acrylic resin paints, see *Learner 2000: 98-99* and *Golden et al. 2004: 4-5*.

### *Alkyd resins*

Alkyd resins are oil-modified polyesters. The film-forming process of these resins is similar to that of a pure drying oil, requiring the incorporation of oxygen into the film. The polyester component's two main ingredients (a polyhydric alcohol and a polybasic carboxylic acid) produce a hard, cross-linked thermosetting resin. However, the degree of cross-linking can be significantly reduced by the incorporation of a monobasic fatty acid in the paint formulation. Alkyd paint is typically found on works of art in the form of house or aerosol paint (Learner 2004: 17).

### *Poly(vinyl acetate) resins*

Poly(vinyl acetate) resins are, like acrylics, generally aqueous dispersions and thought to form films by the same mechanism. However, PVAc dispersions typically require the addition of a plasticizer to soften the polymer particles during drying as they are otherwise too hard and brittle to form a continuous film (Learner 2004: 16).

### *Cellulose nitrate*

'Nitro-cellulose and pyroxylin are terms used to describe a range of materials that consist of blends of different types of cellulose nitrate' (Crook & Learner 2000: 15). The material can be transformed for use as a binding medium through the addition of a resin and a plasticiser, followed by dissolution in an organic solvent. Since the paints are formulated as solution paints, once dried, they are readily re-dissolved in the same solvents with which they were created – typically esters, alcohols, ketones, or glycol ethers (Learner 2004: 22).

*Table 2.1 Common paint types and their drying modes (English Heritage 1999: 2)*

| **Paint Binding Agent** | **Thinner** | **Drying Mode** |
|---|---|---|
| Acrylic resin | | |
| *acrylic emulsion* | Water | Coalescence of an emulsion |
| *acrylic solution* | Organic solvent | Evaporation of a solvent |
| Alkyd resin | Organic solvent | Polymerisation by chemical reaction with oxygen or moisture in the air, or with a hardener |
| PVA | Water | Coalescence of an emulsion |
| Cellulose | Organic solvent | Evaporation of a solvent |
| Polyurethanes | Organic solvent | Polymerisation by chemical reaction with oxygen or moisture in the air, or with a hardener |

**Figure 2.2:** *'California School of Fine Arts' by Diego Rivera, 1931, located within the San Francisco Art Institute in San Francisco, California. A number of Mexican muralists such as Diego Rivera painted politicized wall paintings across the United States in the early part of the 20th century which are today considered extremely important works of art.* **Photo: V. Barthelmeh 1982.**

*Below are two examples of WPA murals depicting industrial and agricultural scenes which were sponsored by the US government in the 1930s and 40s.*


**Figure 2.3:** *'Southern Pattern' by Stuart R. Purser, 1941, located on the Ferriday post office, Louisiana.* **Photo: J. Bingham.**

**Figure 2.4:** *'People of the Soil' by Edward Boyd Johnson, 1939, located on the Dickson post office, Tennessee.* **Photo: H. Hull 2003.**

**Figure 2.5 (left):** *Dedication ceremony for 'Unidos para Triunfar'. John Weber (director) with his team of community members and local youth. Many murals such as this one were initiated as part of community outreach programs.* **Photo: Cockcroft et *al*. 1974.**


**Figure 2.6 (right):** *'Unidos para Triunfar' by John Weber and local team, 1971-1974, Division and Hoyne Streets, Chicago. Image of completed mural.* **Photo: Cockcroft et *al*. 1977.**

*Many of the paintings of the community mural movement like Figures 2.7, 2.8 and 2.9 shown below were painted as a means of recording the histories of those people and events which were and are otherwise largely neglected in mainstream education.*


**Figures 2.7 (above):** *'To protect and serve' by Noni Olabisi, 1995, commissioned by SPARC through the Neighborhood Pride Program, 3406 11th Ave, South Los Angeles, California.* **Photo: N. Olabisi 1995.**

**Figure 2.8 (above):** *'Ghosts of the Barrio' by Wayne Healy, 1974, Ramona Gardens, East Los Angeles, California.* **Photo: R. Dunitz 1993.**

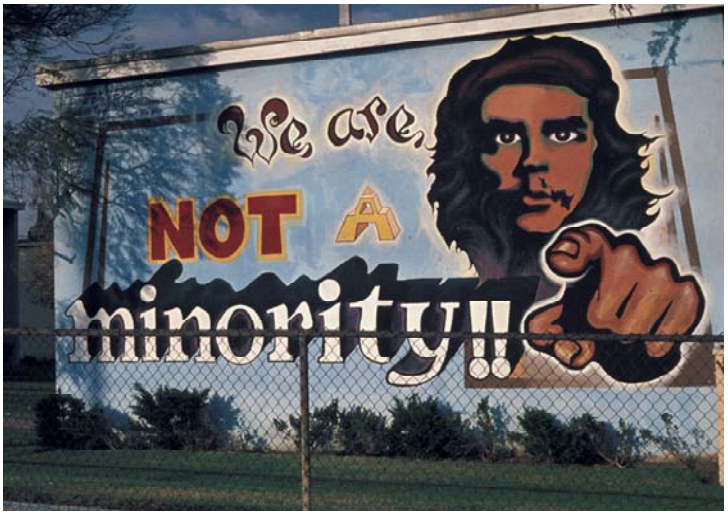



**Figure 2.9 (above):** *'We are not a Minority' artist and date unknown, Los Angeles, California.* **Photo: E. Long 1976.**

**Figures 2.10 (above left) and 2.11 (above right):** *'Ed Ruscha Monument' by Kent Twitchell, 1978-87, located on S. Hill St in Los Angeles, California. The above images depict Twitchell's mural prior to completion. It is possible to see the white layer of acrylic gesso which Twitchell, like most artists, used to prepare the wall surface for painting* **Photo: V. Barthelmeh 1981.**

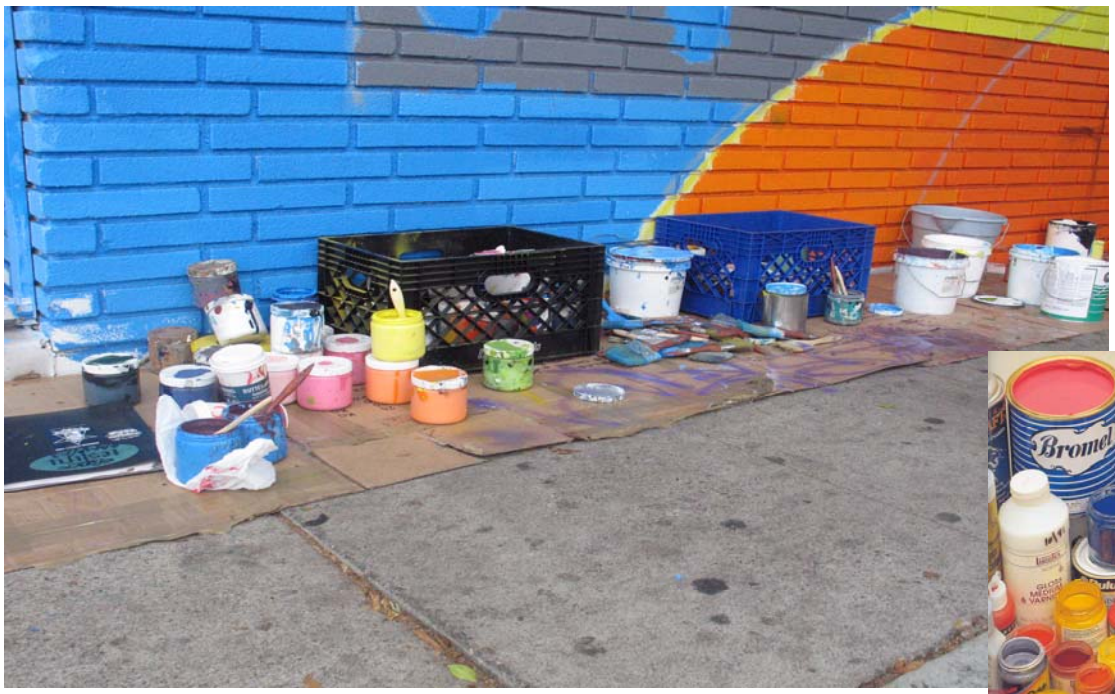


**Figure 2.12 (above):** *Image showing the range of modern, synthetic resin paints used during the creation of a recent mural by John Zender Estrada and local youth in Los Angeles, California.* **Photo: Courtauld Institute CWPD 2006.**


**Figure 2.13 (right):** *A vast range of modern synthetic resin paints have been developed during the past century and are the most commonly used types of paints by artists of contemporary mural paintings.* **Photo: Crook & Learner 2000.**

# Section 3: Graffiti Materials and Their Application

## *3.1 Graffiti Materials*

A wide range of materials is commonly used as graffiti products including, but perhaps not limited to, the following:

- aerosol spray paint,
- liquid paint,
- felt-tip marker pens,
- ball-point pens,
- chalk,
- pencil,
- lipstick,
- wax/crayons,
- adhesive posters and stickers, and
- incising tools.

Although the materials used in acts of vandalism are vast, the scope of the current project was limited to the removal of aerosol spray paint *only* since this form of graffiti is by far the most commonly encountered type of graffiti on exterior mural paintings.

## *3.2 Aerosol Paint*

### 3.2.1 Reasons for popularity

Aerosol paints are by far the most heavily used materials in the application of graffiti. This is evident in Chicago where graffiti has been only a minor issue since a 1996 ban on the sale of spray paint went into effect (Pounds 2003: 6). Aerosol spray paints are extremely popular with graffitists for the following reasons (Whitford 1992: 18).

- There are no limitations of surfaces to which they can be applied (*Figure 3.1*)
- A large surface area can be covered rapidly
- The intensity and thickness of the marks produced can be easily altered by switching nozzle types on the spray can
- Drying time is extremely short, which reduces the chances of removal before setting
- The paints are available in an incredibly wide range of colours and finishes, aiding in visibility and individuality of the markings
- An extensive range of paint compositions are available, increasing the chances of resistance to chemical removal agents

### 3.2.2 Application

Aerosol paints are paints packaged in a spray can form (*Figure 3.2*). Solvents which act as propellants are included in the paint to propel it from the can onto a designated surface. The operator can achieve different types of painted marks by adjusting the spray distance and width or shape of nozzle opening used.

### 3.2.3 Composition

Spray paints are made up of four basic components (English Heritage 1999: 2):

- colorants;
- a binding agent (the component which binds the pigment in place after the paint has dried);
- fillers; and
- organic solvents (in which the binding media is dissolved and which act to propel the paint).

The range of binders and solvents used to create these paints is vast. The solvent range in particular can differ, not only between paint brands, but even between paint colours. The binding media and solvents used in the formation of these paints determine which solvents will be able to solubilise the aerosol paint once applied. Unfortunately once dried, there is no way of visually distinguishing or identifying the aerosol paint types (English Heritage 1999: 2). The paints can only be accurately identified with various instrumental analytical techniques such as Fourier Transform Infrared Spectroscopy (FTIR) and Pyrolysis-Gas Chromatography-Mass Spectrometry (PY-GCMS),[6] or with far less precise methods such as solubility testing which will provide a general idea of what binding material might be present based on its solubility.

Some common aerosol paint binders include acrylic resins, alkyd resins, cellulose nitrate, and, increasingly, polyurethane (Whitford 1992: 18). Not surprisingly, the paints are formulated with the same range of binding media as artists' brush paints. Resins such as the alkyds and polyurethanes, unless modified, will cross-link upon drying to form a very hard film, particularly resistant to solvent removal (Learner 2004: 18). Graffitists are gravitating toward the use of these stronger paint materials since they are much more difficult to remove and will therefore remain visible for longer (Whitford 1992: 18).

It is important to note that because the binding media used to create aerosol paints are commonly the same as those used in the production of artist brush paints, the two materials will likely be soluble in the same solvents. However, the paints used in the original creation of murals will typically be much older, exposed longer to environmental elements, and therefore much more degraded than the fresh aerosol graffiti applied. Therefore, the original paint materials will often be even more susceptible to organic solvents than aerosol paints of similar composition.

[6] See Jönsson & Learner 2004: 58; Learner 2004; Learner 2001.

**Figure 3.1:** *Venice Beach, California. The variety in color and finish which can be achieved and the fact that there is no limitation of surfaces to which aerosol paints can be applied make them an extremely popular media amongst graffiti artists.* **Photo: Courtauld Institute CWPD 2006.**

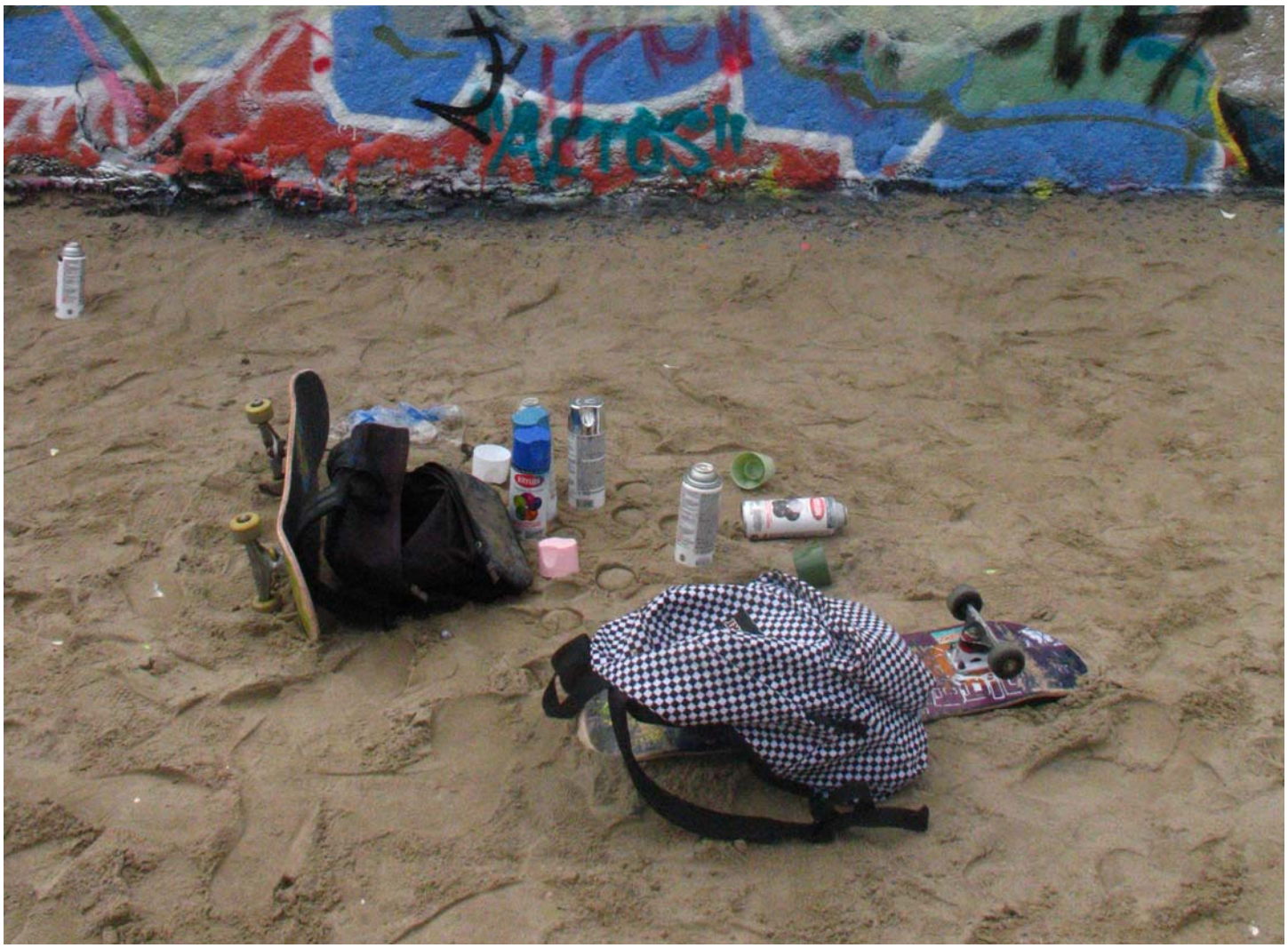


**Figure 3.2:** *Venice Beach, California. An example of aerosol paint materials used in graffiti painting.* **Photo: Courtauld Institute CWPD 2006.**

# Section 4: State of the Graffiti Removal Problem

## *4.1 Previous Literature*

There currently exists an extensive body of research on vandalism-related issues, including graffiti materials and approaches to their removal from both historic and non-historic surfaces. The presence of graffiti has become a major concern for countries worldwide, particularly in the past fifty years, as a result of increased development and availability of cheap and fast mark-making materials (Historic Scotland 2005: 2). This is reflected by the available literature on the subject. Bodies with responsibility for of historic sites such as *English Heritage*, *Historic Scotland*, and the *US National Park Service*, have devoted much time and energy to researching the causes of graffiti vandalism and effective methods of removing it safely (Historic Scotland 2005; English Heritage 1999; Weaver 1995). The majority of these studies are devoted to the removal of graffiti from stone, masonry, or other porous materials.

Most of the literature on graffiti removal warns against the use of aggressive chemical removal systems on painted surfaces, but does not provide alternative methods for removal in these situations or describe how to safely implement a cleaning treatment on these surfaces. Few field studies have actually been undertaken which specifically assess graffiti removal from painted surfaces. One recent study did test the use of a range of available proprietary graffiti removal products for the purpose. However, results were unsuccessful, and it was concluded that 'no product was completely successful at removing graffiti without also smearing the surface paint – although some products like SOYsolv® dulled the graffiti without disturbing the surface paint too much, which may make painting over the graffiti easier' (Stack 2003: 9).

Published studies on the cleaning of modern paint materials generally are also limited (Golden *et al.* 2004: 1), though becoming more frequent. The studies that currently do exist are typically specific to the cleaning of modern easel paintings and typically acrylic paint films. Many discuss the use of dry cleaning methods while others discuss concerns related to the use of wet methods.[7] While these studies are extremely useful, they are of limited relevancy with regard to large-scale paintings which have been exposed to environmental elements for significant periods of time.

## *4.2 Intended Aims of Research*

The intent of this research is to investigate the potential for the removal of aerosol paint graffiti from the surfaces of contemporary external mural paintings by means of solvent cleaning. It will specifically consider *approaches* to identifying solvent cleaning systems safe for use on unidentified modern synthetic paint materials since the identification of these materials is only possible through time consuming and costly analytical techniques.

The scope of the project is limited to trials for the removal of painted aerosol graffiti material as this was observed to be the most commonly encountered form of graffiti on mural paintings. Furthermore, time limitations restricted the range of graffiti materials which could be assessed.

[7] See Golden 2001; Golden *et. al.* 2004; Learner 2002; Banks & Rutledge 1999; and Saulnier & Thibault 2005.

# Section 5: Graffiti Removal Issues

'Beyond the difficulty of just painting well on a large wall, there are political, social, environmental, and fiscal obstacles to creating and maintaining murals' (Pounds 2003: 4). The removal of graffiti is one aspect of mural maintenance which faces many obstacles in implementation. These obstacles, which are both ethical and technical, are briefly described below.

## *5.1 Intended Aims of Research*

### 5.1.1 Cleaning as an intervention

Cleaning as an intervention is an ethically controversial issue. Theoretically, conservation – 'the physical stabilization of a painting in its present condition' (Cather 2003: 65) – should only be undertaken when a *problem* exists. A 'problem' in this sense of the word has been defined as 'imminent risk of loss of original material' (Cather 2003: 65). This is true primarily because the limited resources available for wall painting conservation should not be dispensed on unnecessary treatments and because all interventions pose some risk to the object and should therefore only be undertaken when unavoidable. If a problem does not exist, the implementation of a treatment is by definition *restoration*, not *conservation*.

Cleaning is commonly undertaken for aesthetic purposes and for this reason can be considered a controversial use of scarce resources. However, the treatment is truly necessary and justifiable in the case of graffiti removal from wall paintings since the presence of graffiti poses an imminent risk of loss of original material for two reasons:

- Graffiti attract the application of additional graffiti, which if allowed to build up, will eventually consume the entire surface of a painting.
- If graffiti are not removed from a mural, the mural will likely be painted out, torn down, or fall into a state of complete abandonment and disrepair.

In this sense, the removal of graffiti is an essential, and indeed urgent, conservation treatment.

### 5.1.2 Artists' rights

In December 1990, Congress passed the VARA which, among other things, grants artists the right to protect their works from modification or destruction by imposing 'a legal liability for those who destroy, alter, or mutilate a mural and requires conservators to preserve the artistic intent of the artist' (Garfinkle 2003: 4). 'Under VARA, a conservator may be liable to an artist for the intentional or grossly negligent destruction of a work of recognized stature' (Garfinkle 2003: 16). The conservator must therefore obtain written permission from the artist prior to carrying out an intervention.

### 5.1.3 Responsibility

Conservation of the community mural is often complicated by a lack of designated responsibility. Although responsibility is on occasion allocated by contract to one individual at the time of its creation – as is the case for all murals painted on property under the jurisdiction of the California Department of Transportation (Caltrans) (Caltrans 2005: 57) – this does not often occur. Many important murals, such as those by artist Peter Quezada, were painted without contract or specific authorization. They are public works, often

painted on public property and 'owned' not by one person, but by a group of people or *stakeholders*. The group of stakeholders can include the artist, the property owner, the community members, the individuals whose interests the mural represents, and the artist's beneficiaries if the artist is deceased (for up to fifty years following the artist's death) (Garfinkle 2003: 11). The municipality can also be said to share responsibility in the mural even if it is not the property owner or it was not officially involved in the mural's creation (Drescher 2003: 13). When so many individuals' interests are involved in one specific object, there is no clear means of allocating responsibility.

### 5.1.4 Which murals are conserved?

Not all the murals in existence can be conserved or saved. This is due to lack of funding, expertise, time, and materials. Yet, how should the decision be made to save one mural rather than another? Murals often represent the history of a culture excluded from books and other official sources (Baca 2002: 21). Judith Baca, founder of the SPARC mural program, points out in her article, 'Public participation in conservation 1: *The Great Wall of Los Angeles*', that since only some of these histories will be conserved and therefore remembered, 'does selective conservation become a method of censorship?' (Baca 2002: 22). She goes on to argue that since various murals are significant for different but equally important reasons, they should be categorized accordingly and ranked within that category. The categories she has defined with SPARC members, a panel of LA muralists, conservators, and scholars, and outlines in her article include the following:

- *Works of historical significance* – e.g. works by the *Works Progress Administration* (WPA), early muralists (Mexican muralists), and early works of significant artists (*Figures 5.2 and 5.3*);
- *'Pulqueria' works* – 'iconic works painted on the sides of bars and restaurants' (*Figure 5.4*);
- *Works of community significance* – portraits, religious images, memorials, or other imagery significant to the mural's everyday audience (*Figure 5.5*);
- *Legacy murals* – works by important artists who were in someway influential to the mural movement (*Figure 5.6*);
- *Emergency status murals* – 'works in imminent danger of disappearance either through deterioration or removal' (*Figure 5.7*).

### 5.1.5 Who decides?

Who should decide which murals are saved? The question can be extremely difficult to answer as so many stakeholders are involved with community murals and each will have a different agenda concerning the conservation of those murals. Therefore, the decision can only fairly be reached, not by one person, but by a panel of people involved with community murals. According to Drescher, the panel should include the following parties (Drescher 2003: 7):

- People familiar with the community and the murals' involvement within that community,
- People familiar with mural art history,
- People trained in assessment of mural aesthetics,
- The property owner, and
- Members of the proposed conservation team.

### 5.1.6 Natural lifespan

Although many people share the sentiment that because 'murals document strictly contemporary attitudes, they deserve to last and enter history, as medieval shrines did, as Mexican murals do' (Weber 2003: 13), the reality of the matter is that wall paintings are objects and no object is permanent. Murals each have a lifespan which can be extended (with conservation) or shortened based on circumstances. Exterior, contemporary murals may have a particularly short natural life span given the impermanence of materials on which and with which they were painted, serious exposure to environmental elements, and a general disregard for preservation at the time they were originally painted. Furthermore, since, as previously discussed, the majority of contemporary murals were not conceived as integral to the supports on which they were painted, it is not surprising that many are incompatible with their supports or undergo casualties caused by alterations to the buildings or other supports on which they are painted[8]. This is not to imply that contemporary murals should not be preserved, but their limited natural lifespan should perhaps influence *how* they are preserved.

## *5.2 Resources*

### 5.2.1 Funding

The availability of funding is perhaps the largest obstacle in the conservation of contemporary mural paintings. The communities in which the murals are situated are rarely able to pay for their maintenance and conservation (Drescher 2003: 13), and often, because the murals are not of conventional, artistic interest, civic bodies and bureaucratic agencies are unwilling to advocate funding for their survival (Baca 2002: 22). Furthermore, due to the sheer number of contemporary murals in existence and the high cost of conservation work, the resources are not available to conserve even a fraction of them.

### 5.2.2 Expertise

Many people would agree that, particularly due to funding and time constraints, contemporary mural paintings should be repainted rather than conserved by a professional. However, according to Jon Pounds, executive director of the Chicago Public Art Group (CPAG), the preservation of a mural 'requires more than just recapturing the original look of the mural' (Pounds 2003: 10). It would seem that a professional conservator or the original artist would have the best chance at recapturing the original meaning of the work. Even when the original artist is available to undertake repainting, the involvement of a conservator is extremely advisable to make suggestions pertaining to which materials and techniques should be implemented for best preservation of the mural in the future. Furthermore, often the use of organic solvents and other chemical compounds are required for graffiti removal from a mural painting and a professional should be available to advise on the health and safety issues involved with their use.

Unfortunately, expertise of this type is not widely available. The number of professionals trained in conservation specific to exterior wall paintings is extremely low and surely not anywhere near the vast number of murals in dire need of preservation.

[8] For a more detailed discussion of the problems associated with the mural's relationship to its support, refer to Graves 2007.

### 5.2.3 Re-tagging

In cities such as Los Angeles, even when funds, time and expertise are allotted to graffiti removal from an exterior mural painting, chances are extremely high that the mural will be tagged again within days or even hours of the completion of treatment (*PC* Moreno 2006). Given that resources are unavailable for even a single treatment of each mural in need, they are certainly not available for continuous monthly or weekly treatments of an individual painting.

## *5.3 Materials*

### 5.3.1 Condition of the painting and support

The condition of the original materials within a mural painting is a major factor in successful graffiti removal. If the painting is in poor condition and the original materials are weak or deteriorated they will be more heavily impacted and quite possibly damaged by attempts at surface cleaning. Unfortunately, exterior murals are commonly encountered in extremely poor condition. The materials with which and on which these they are painted will degrade with exposure to UV light rays and other environmental elements.

### 5.3.2 Graffiti removal products

Although commonly used to remove graffiti from wall paintings, proprietary graffiti removal products are extremely problematic for the following reasons.

- *They are 'proprietary' materials* – it is typically impossible to find out what components they include or what ratio of these components are present.
- *Composition* – although the exact recipes are not available for these products, the majority of paint and ink removers are solvent-based, or more specifically, based on a mixture of co-solvents. Because this solvent base is typically thin and free-flowing, non-volatile components such as inert thickening agents, abrasives, and surfactants may also be added to improve the products' working properties (Whitford 1992: 23).
- *Health and safety* – many of the products are composed of a mixture of organic solvents which commonly present high health and safety risks during use.
- *Environmental hazards* – the chemicals contained within the products are often hazardous to the environment when released into the air or disposed of incorrectly.
- *Intended use* – the products are created with the intention of being effective in a variety of situations, on a variety of graffiti materials. Due to their affinity for a wide range of paint materials, they will not distinguish between original paint and graffiti paint materials when applied to a mural surface (Whitford 1992: 23).
- *Application* – the product packaging, viscosity, and instructions for use are generally not conducive to the removal of one paint layer from another.

### 5.3.3 Specificity

'The concept of specificity or selectivity relates to the properties and impacts of cleaning agents on original and on unwanted, non-original materials' (Martin de Fonjaudran 2004: 42). Ideally, the cleaning agent selected should, through means of chemical or physical reaction, alter the 'coating' or added material so that it can be separated and removed with little or no effect on the original materials (Phenix 1998: 387).

However, solvents and most aqueous-based alkaline reagents are not very specific in their action and will affect, to a varying extent, a wide range of organic materials. The ability of a

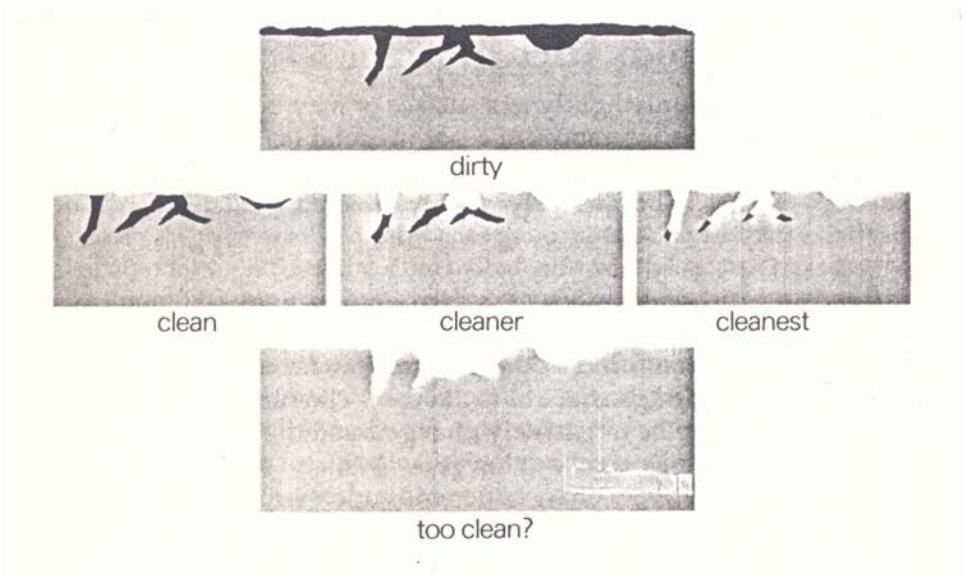
cleaning agent to selectively remove a material without altering others depends greatly on the chemical similarity between the two (Martin de Fonjaudran 2004: 42). Unfortunately with regard to the present study, the paints used in contemporary mural painting are often extremely similar chemically to the graffiti paint materials applied. Furthermore, because of the vast range of graffiti paint materials which are likely to be present on the surface of a mural, a cleaning agent with a lower specificity and higher affinity for all paint materials is often required for complete removal.

## *5.4 Damage*

### 5.4.1 Cleaning as an intervention

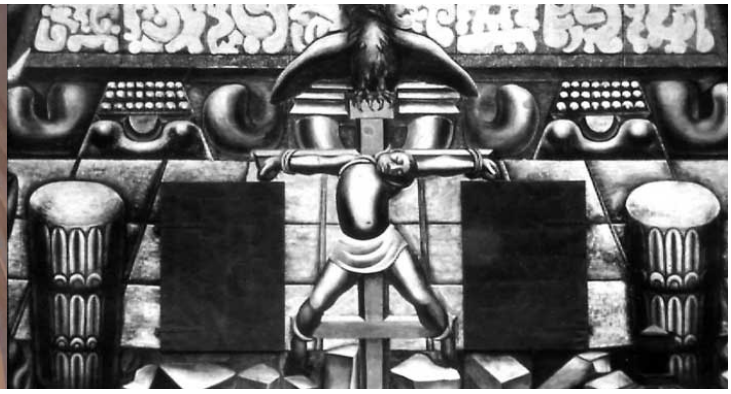
Cleaning is defined as the removal of *dirt* – or unwanted, non-original materials – from an object. In theory, the safe removal of the dirt from the original object should be possible, assuming that the two can be distinguished. In practice, however, because of topography and, to a lesser extent, porosity, it is rarely possible to separate and remove the dirt without taking some of the object too (Moncrieff & Weaver 1987: 15). Since wall paintings are painted on porous surfaces, which are also likely to have a very irregular topography, the separation of dirt can be particularly difficult and damaging to the original materials, depending on the level of cleaning required. With this in mind, the aim of graffiti removal must be *minimization* of damage to the original materials.

*Figure 5.1: Diagram which demonstrates how damage to an object can be caused by over-cleaning. 'To remove only the dirt when it is so intimately mixed with the object is not easy and becomes more and more difficult the cleaner you want the final product to be' (Moncrieff & Weaver 1987: 15).*




### 5.4.2 Repetition of treatment

As described previously, the tagging and re-tagging of a mural surface is a common occurrence. It is not uncommon for the reappearance of graffiti just days or even hours after its complete removal from a surface. Given that cleaning is always damaging to the original object to some degree (however slight), the repeated removal of graffiti from a painted surface month after month or week after week is not an option. At some point there will be no original surface left to clean.



*Two examples of works of historic significance are depicted above.*

**Figure 5.2 (top left):** *'Prometheus' by Jose Clemente Orozco, 1930, Frary Hall, Pomona College Claremont, California.* **Photo: R. Dunitz 1993.**

**Figure 5.3 (top right):** *'Tropical America' by David Alfaro Siqueiros, 1932, on the exterior of the Italian Hall, Olvera St in Downtown Los Angeles.* **Photo: Olvera-Street.com 2007**


**Figures 5.4 (left):** *Unidentified mural, exterior of Casa Carnitas Restaurant in Los Angeles, California. Example of a 'pulqueria' work.* **Photo: E. Long.**

**Figure 5.5 (above):** *Untitled Virgin of Guadalupe by Armando Cabrera, 1974, Ramona Gardens in East Los Angeles. Example of a work of community significance.* **Photo: R. Dunitz 1993.**

**Figure 5.6 (above):** *'The Great Wall of Los Angeles' by SPARC, 1976-1983, located in the Tujunga Wash drainage canal, Los Angeles. Example of a legacy mural.* **Photo: Courtauld Institute CWPD 2006.**

**Figure 5.7 (right):** *'L.A. Marathon Mural' by Kent Twitchell, 1990, the 405 freeway, Los Angeles. Example of an emergency status mural.* **Photo: N. Zakheim 2004.**

# Section 6: Current Methods of Graffiti Removal

## *6.1 Removal Systems Available*

Three general systems are available and currently used for the removal of graffiti: mechanical, photomechanical, and chemical. Although mechanical (scalpels, brushes, air abrasion, high pressure water cleaning, steam cleaning, etc.) and photomechanical (lasers) methods exist and have been used in the past to remove graffiti, time restrictions only allowed for the assessment of chemical methods of removal – specifically that of solvents – within the scope of this project. Mechanical and photomechanical methods were eliminated due to cost, availability of equipment, portability, scale of the murals, and other logistical considerations. Furthermore, it was thought that chemical systems would provide the least potentially damaging method of removal. Finally, since proprietary graffiti removal products are commonly used to remove graffiti from mural paintings in the field, and since these products are mainly solvent-based, it was interesting and useful to compare the results of cleaning with known solvents to those obtained with proprietary products.

## *6.2 Chemical Removal Methods*

### 6.2.1 Detergents, bleach, and alkaline compounds

Water and non-ionic detergents – depending on their application – are the gentlest means of graffiti removal available. Unfortunately, they are only effective against recent marks of water-soluble materials such as some markers, and will have no effect on painted graffiti (Weaver 1995: 5).

A few cleaning agents for the removal of graffiti are based on bleach which destroys the graffiti colour rather than dissolving it. Bleach-based removers are, however, only effective on certain types of graffiti such as felt-tip pen and cannot be used against painted graffiti as the polymer content prevents effective bleaching (Whitford 1992: 28).

Alkaline compounds are likewise ineffective against painted graffiti materials but may be used to remove some oil, grease, and wax graffiti from non-alkali sensitive surfaces (Weaver 1995: 5).

### 6.2.2 Solvents

All other chemical removal methods are based on the use of solvents and are the only chemical removal methods effective on painted graffiti. In fact, since like substances dissolve like, one would expect to use organic solvents to dissolve organic dirt (e.g. paint). Organic solvents are furthermore advantageous since they evaporate entirely, leaving no residual material in the painting system. Currently the solvent types typically used for graffiti removal can be divided into five categories (Whitford 1992: 25):

- containing chlorinated hydrocarbons;
- containing monoglycol ethers and glycol acetates;
- containing diglycol ethers;
- containing polar solvents; and
- those containing miscellaneous solvents.

Although proprietary graffiti removal products commonly used for the removal of graffiti from murals are composed mainly of organic solvents, their working properties are often adapted with the addition of inert thickening agents, abrasives, and/or surfactants (Whitford 1992: 23). These materials may therefore be problematic for use on wall paintings since the additives are typically non-volatile and may remain in the system following removal.

# Section 7: Case Studies Selection Criteria

## *7.1 Selection Criteria*

A number of criteria were set out prior to site assessment in Los Angeles to enable the selection of potential case studies. Due to the extensive number of mural paintings in Los Angeles – well over 1,500 officially recognized murals (Rainer 2003: 5; Baca 2002: 22) - time limitations did not permit inspection of every painting. Therefore, an initial review of paintings was made using the *City of Los Angeles Cultural Affairs Department* mural database and the first edition mural reference guide by Robin Dunitz (1993). Only those paintings which appeared to meet the specific criteria outlined below were short-listed for on-site evaluation. Over two hundred short-listed murals were then visited (*Appendix 1*). Of these, approximately a quarter could not be located because their listed address was incorrect or they had been painted out or destroyed since last recorded (*Figures 7.1 and 7.2*). Those which could be located were physically inspected and assessed in terms of the criteria.

The case study review and selection process was undertaken in conjunction with colleague Kiernan Graves, who was likewise researching contemporary, exterior mural paintings for her MA Dissertation (*see Graves 2007*). To make the best use of limited time and resources, case studies appropriate for use in both projects were chosen whenever possible.

In total, the aim was to choose between four and six paintings on which to undertake cleaning trials. Time restrictions limited the number of case studies which could feasibly be tested, yet a good range of studies was considered necessary to the formation of conclusions applicable to a wider context.

### 7.1.1 Access

Access to the paintings was a primary concern as permission to work on an individual mural was required from both the artist and current property owner. Paintings were eliminated if obtaining permission from either stakeholder appeared unlikely.

Physical properties of the paintings themselves also created access complications as funding, time, and mobility prevented the use of scaffolding on site. Therefore, it was essential that the murals were accessible at ground level.

### 7.1.2 Original and added materials

#### *Original materials*

Case study selection was restricted to murals executed primarily with acrylic paint materials to ensure that cleaning issues among case studies remained as comparable as possible. Furthermore, only paintings on cement supports were considered, again to minimize project variables and as this was a primary requirement for colleague Kiernan Graves. Finally, it was useful to avoid *stucco* and other heavily textured surfaces if possible as this would again complicate the cleaning trials (*Figures 7.3 and 7.4*).

#### *Added materials*

Perhaps most significantly, case studies selected had to be covered with a considerable amount of aerosol graffiti material (*Figures 7.5 to 7.9*). The graffiti had to be extensive in order to provide a comprehensive range of conditions and locations for removal trials.

### 7.1.3 Significance assessment

The significance of a wall painting plays an important role in any conservation intervention. Due to a lack of resources, not every painting can be conserved and therefore limited resources should be used for the most worthy and justified cases. Assessing the significance of the *community mural* however is complicated by unique or untraditional criteria by which they must be evaluated. The criteria by which they are most usefully evaluated have been discussed extensively by scholars and are outlined in sections *2.3* and *5.1.4* of this study.

### 7.1.4 Location

The painting's location was of great consideration as limited time and resources placed geographical restrictions on the selection of case studies. The paintings had to be within the greater Los Angeles area. Furthermore, due to the help afforded by the *City of Los Angeles, Cultural Affairs Department* in gaining permission to work on murals which fell under their jurisdiction, it was valuable to locate suitable murals within the City of Los Angeles rather than neighbouring cities.

Safety was also an issue with regard to location. For security purposes certain areas of the city, although filled with a high volume of important mural paintings, were excluded from consideration due to the probable risks for a solo conservator.

### 7.1.5 Condition

Due to the aims of the project, it was essential that the case studies have multiple sites in good condition for cleaning trials. It was necessary to have stable paint layers in trial areas so that assessment of cleaning trials would be straightforward and results would be comparable between various locations and cases.

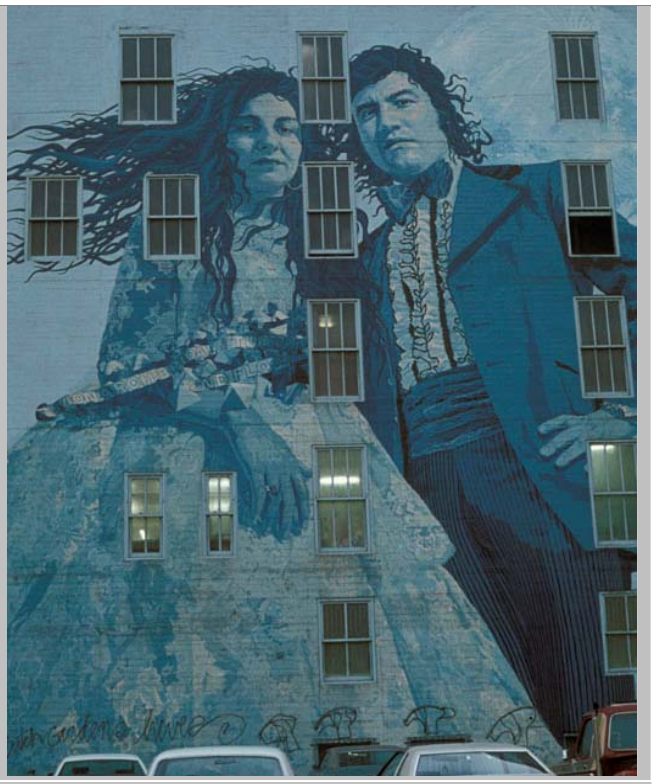
### 7.1.6 Available documentation

No comprehensive analysis was intended for the identification of the murals' original or added materials as the resources for such analysis were unavailable. It was therefore extremely useful to locate paintings with sufficient documentation or background information available including sources such as articles, conservation or other reports (*see Appendices 4.3.9, 4.4.9 and 4.5.9*), historic images, and primary information from the artist.

## *7.2 Case Studies*

### 7.2.1 Case Study 1 – *The Bride and Groom;* Kent Twitchell

*Table 7.2 Case study 1 background information*

| | |
|---|---|
| *Title:* The Bride and Groom |  |
| *Artist:* Kent Twitchell | |
| *Designated Case Reference no.:* 102 | |
| *Size:* 70 x 70 ft. | |
| *Date:* 1972 - 1976 | |
| *Subject Matter:* The mural, painted in a monochromatic palette, depicts a larger-than-life, photo-realistic image of a Latino couple clothed in wedding attire (Dunitz 1993: 36). The male figure is a portrait of Carlos Ortiz, former owner of a 2nd floor bridal shop in the Victor Clothing Co. building (Maese 2007). | |
|  | |
| *Photo: Courtauld Institute CWPD 2007* | *Photo: E. Long 1980* |
| *Physical Context:* The painting is located on the northeast face of the Victor Clothing Co. building, located at 240 S. Broadway St. in Downtown Los Angeles. The building is a former men's clothing headquarters and was most recently purchased by *Neighborhood Efforts* which plans to transform it into affordable housing units above commercial space (Maese 2007) ( *Appendices 4.22 and 4.24*). | |
| *Significance:* Kent Twitchell is one of the most respected and renowned outdoor urban muralists in the world and is likely regarded as Los Angeles' most prominent present-day muralist. He is perhaps most recognized for his over-sized, photo-realistic portraits, executed on the exterior surfaces of buildings across Los Angeles. *The Bride and Groom* is Twitchell's first (Maese 2007) and one of the most well-known and technically admirable of these murals. | |
| *Condition:* The mural is in a generally good condition. Although covered by layers of graffiti paint in the lower section (*Figure 10.10*), the original paint layer is sound. Some cracking and flaking of the paint layer is apparent, however this deterioration is not extensive and appears to be related to cracking or deterioration of the cement support (*Appendix 4.2.3*). | |
| *Added Materials:* A protective coating of Nova Color gel medium was applied to the lower section of the painting in the late 1970s (*PC* Twitchell 2007). The medium is rather soft and wax-like, and therefore attracts smog and dirt. It furthermore appears to have contracted over time, producing a network of fine vertical cracks which expose the original paint surface beneath (*Figures 10.12 and 10.13*). The surface has subsequently been heavily tagged with both aerosol and brush paint, creating a thick layer of graffiti on top of the deteriorated coating. | |
| *Available Documentation:* Very little written documentation about the painting or building was accessible, however direct contact with the artist was made. | |

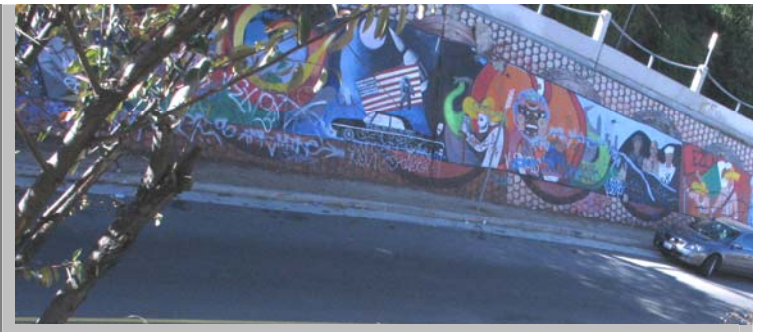
## 7.2.2 Case Study 2 – *Flow Inversion;* Judith Von Euer

*Table 7.3 Case study 2 background information*

| | |
|---|---|
| *Title:* Flow Inversion<br>*Artist:* Judith Von Euer<br>*Designated Case Reference no.:* 104<br>*Size:* 21 ft. 10 in. x 142 ft. (LACAD 2002)<br>36 ft. x 135 ft. (Dunitz 1993: 35)<br>*Date:* 1974 |  <br>*Photo: E. Long 1974* |
| *Subject Matter:* The mural depicts an abstract diagram of a system of interactions between freeway and pedestrian traffic. It is painted in tonal variations of gray and based on a series of the artist's canvases (Dunitz 1993: 35). | |
| *Physical Context:* The painting is situated on the northeast retaining wall of the 110 freeway at 1st Street in Downtown Los Angeles. The site is owned by Caltrans and the mural therefore falls under their jurisdiction (*Appendices 4.3.2 and 4.3.4*). | |
| *Significance:* Flow Inversion was painted as part of The Inner City Mural Program, the first government-sponsored mural program in Los Angeles, which commissioned twenty murals between June 1, 1973 and May 31, 1974 (Several 2000). | |
| *Condition:* The mural shows a good deal of hairline cracking which appears to be caused by similar cracking in the support. Some peeling of the paint layer is evident (*Figures 10.49 and 10.50*) but in general the paint layer is coherent and stable (*Appendix 4.3.3*). | |
| *Added Materials:* The painting is reportedly covered by a non-original anti-graffiti (AG) coating (*Appendix 4.3.9*) which is visible when a layer of superficial deposition is removed from the painting surface. The coating is recorded as 'waxed-based', however is not embedded with dirt particles. The painting has been heavily tagged with both aerosol and brush paint, creating a thick layer of graffiti on top of the coating. Intermittent repainting of the lower 8 feet of the mural is reported to have taken place in 1994 however graffiti now covers any evidence of this (*Appendix 4.3.9*). | |
| *Available Documentation:* LA City Cultural Affairs Department report (*Appendix 4.3.9*) | |

### 7.2.3 Case Study 3 – *Untitled*; Janet Sellers and James Garcia

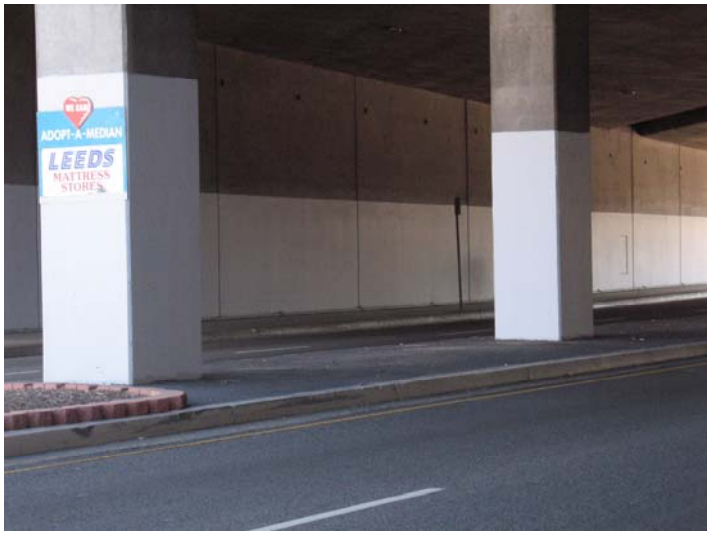
*Table 7.4 Case study 3 background information*

| | |
|---|---|
| *Title:* Untitled |  |
| *Artist:* Janet Lee Sellers and James Garcia with local youth | |
| *Designated Case Reference no.:* 105 | |
| *Size:* 2 panels, approx. 8 x 100 ft. each | |
| *Date:* 1985 | |
| *Subject Matter:* The mural chronicles major events in Mexican and Chicano history which are depicted in roundels and framed by the body of the Mesoamerican mythical figure Quetzalcoatl (Dunitz 1993: 104) |  |
| *Photos: Courtauld Institute CWPD 2006* | |
| *Physical Context:* The painting is located on two retaining walls situated on either side of the Academy Road entrance to Elysian park (*Figures 10.84 and 10.85*). The property is under the jurisdiction of LA City Department of Parks and Recreation (*Appendices 4.4.2 and 4.4.4*). | |
| *Significance:* The untitled mural, although designed by professional artists, was painted by 35 local youth and rival gang members (Dunitz 1993: 104). It is significant for its representation of Hispanic and Chicano history and is an important icon to the community in which it is situated. | |
| *Condition:* The mural suffers from serious delamination or loss of adhesion to the support (*Figure 10.93*). Areas of severe flaking and peeling are apparent (*Figures 10.89 to 10.92*). The overall condition is poor however locations also exist where the paint layer is extremely sound although slightly weakened due to years of exposure to direct sun and other environmental elements (*Appendix 4.4.3*). | |
| *Added Materials:* The painting is reported to have an acrylic coating (*Appendix 4.4.9*). However, very little evidence of the coating is visible and its original extent is unknown. Furthermore, the mural was at least partially restored in 1991 (Dunitz 1993: 104) during which extensive repainting was likely undertaken after the application of the coating. The mural is currently plagued by the presence of extensive aerosol graffiti. | |
| *Available Documentation:* LA City Cultural Affairs Department report (*Appendix 4.4.*) and contact was made with the artist (J. Sellers). | |

## 7.2.4 Case Study 4 – *Untitled*; Peter Quezada

*Table 7.5 Case study 4 background information*

| | |
|---|---|
| *Title:* Untitled |  |
| *Artist:* Peter Quezada | |
| *Designated Case Reference no.:* 106 | |
| *Size:* 9 ft. 07 in. x 40 ft. | |
| *Date:* 1990 | |
| | |
| *Subject Matter:* Cartoon figures and monochrome images connected with the message, 'A Little Bit of Art Never Hurt Anybody, But a Little Bit of Graffiti Hurts a Lot of People' (Dunitz 1993: 121). | |
| *Photo: R. Dunitz 1993* | |
| *Physical Context:* The mural is located in the 3400 block of North Figueroa Street, between Amabel and Cyprus in Highland Park. It is painted on a concrete retaining wall which separates a number of elevated, residential yards from the street below. The location does not fall under the jurisdiction of any civic department or organization (*Appendices 4.5.2 and 4.5.4*). | |
| | |
| *Significance:* The painting was undertaken as an individual initiative by the artist to remove and deter the reapplication of graffiti along a stretch of this concrete retaining wall. Quezada is a well-known and much-respected artist in the Highland Park area and other districts of Los Angeles. Throughout his career as an artist he consistently attempted to beautify the city and deter vandalism of public and private walls within his residential neighbourhood. | |
| | |
| *Added Materials:* The mural has no coating but has been retouched by the artist on various occasions for the purpose of disguising accumulated graffiti. However, very little has been done to maintain the mural in recent years and as a result, it is now covered by graffiti and other paint. | |
| | |
| *Condition:* The section of the mural depicting cartoon images initially appears to be in a relatively stable condition as it displays very few areas of peeling, loss, or cracking (*Figures 10.28 and 10.29*). However, upon closer inspection, the paint layer was found to be rather thin and weak in cohesion which is likely due to exposure over time (*Appendix 4.5.3*). | |
| | |
| *Available Documentation:* LA City Cultural Affairs Department report (*Appendix 4.5.9*) and personal communication with the artist. | |




**Figures 7.1 (left) and 7.2 (right):** *Upon initial inspection of the murals which had been short-listed for on-site evaluation, a number were found to have been painted out or otherwise destroyed since last recorded. A mural which at one time stretched the entire length of either side of the underpass pictured was encountered in the above state, appearing to have been painted out quite recently.* **Photos: Courtauld Institute CWPD 2006.**

**Figure 7.3:** *'Los Pajaros de California' by Michelle Obregon and Candace Ocampo, 1996-97, located on Van Nuys, 405 underpass in Los Angeles, California.* **Photo: Courtauld Institute CWPD 2006.**

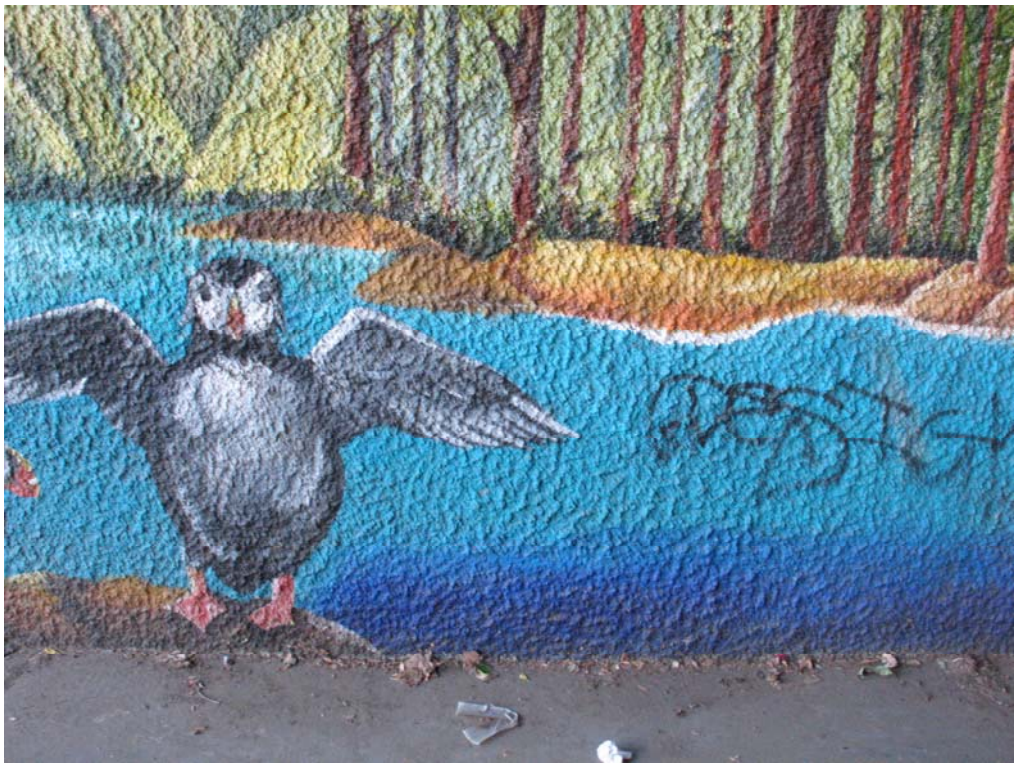


**Figure 7.4:** *Detail of figure 7.3. The pictured mural has a heavily textured, cement-based surface, known in California as 'stucco'. Because of its texture, painted stucco can be incredibly difficult to clean well.* **Photo: Courtauld Institute CWPD 2006.**

**Figures 7.5 – 7.9:** *A number of murals visited were not chosen for trials in the current study since, surprisingly, the amount of graffiti on their surfaces was too limited.*

**Figures 7.5 (above):** *'St Charles Painting' by Terry Schoonhoven, 1979, 21 Winward Ave. in Venice, California. View of the mural as it originally appeared.* **Photo: V. Barthelmeh 1982.**


**Figures 7.6 (above):** *'St Charles Painting' as it appears today. The surface is defaced by only one scrawling tag.* **Photo: Courtauld Institute CWPD 2006.**

**Figure 7.7 (above):** *'Homage to a Starry Knight' by Rip Cronk, 1990, Ocean Front Walk at Wavecrest in Venice, California.* **Photo: V. Barthelmeh 1982.**

**Figures 7.8 (left) and 7.9 (detail; right):** *'Lost Art' by Werner Scharff, 1989, 21 Winward Ave. in Venice, California.* **Photos: Courtauld Institute CWPD 2006.**

# Section 8: Intervention Criteria

From the outset of the project it was decided to test not only free solvents, but their application methods as well. Since the original paint and aerosol graffiti materials were likely very chemically similar, the chances of finding a cleaning agent with an affinity for the added material but not for the original materials were very low. If specificity on a chemical level cannot be established, the selective removal of one layer with minimal impact on the underlying layer will depend on application parameters such as exposure time and diffusion rate of the cleaning agent (Martin de Fonjaudran 2004: 42).

## *8.1 General Conservation Intervention Criteria*

Prior to any conservation treatment, a number of *intervention criteria* should be developed in order to direct and facilitate the intervention process. Intervention criteria relate to prerequisites prior to the implementation of a treatment (Martin de Fonjaudran 2004: 41). Such criteria are essential to provide a framework for the intervention which will ensure that the painting is subjected to the minimal possible risk during conservation. General criteria that apply to any conservation intervention include (Cather 2006: C10 16.05.2006):

- Minimal intervention;
- Preservation of significance (includes contextual, historical, artistic, technological, religious, etc.; and acknowledges that significance may change over time);
- Knowledge of original materials;
- Understanding of the object's physical history and present condition;
- Knowledge of conservation materials and application methods;
- Retreatability/reversibility (assumes a strong possibility of future treatments and/or improvements, and acknowledges the right for future choices);
- Understanding the health and safety parameters involved;
- Documentation;
- Compatibility of the original and conservation materials;
- And assessment of the risk associated with the intervention (if the 'cons' involved in the intervention outweigh the 'pros' involved it should not be undertaken).

## *8.2 Cleaning Intervention Performance Criteria*

Following consideration of the overall, general conservation intervention criteria, further criteria should be developed which are specific to the long-term requirements of the intervention being undertaken. These criteria are known as *performance criteria*. Since cleaning refers to the removal of unwanted, non-original material from a painting, the removal of graffiti is, by definition, a cleaning intervention. The performance criteria for any cleaning intervention include (Martin de Fonjaudran 2004: 41):

- Specificity - separation and removal of *only* the unwanted, non-original materials;
- Clearance - removal of any deleterious, non-volatile residues introduced during cleaning;
- Minimal physical and chemical alteration of original materials;
- Homogeneity of cleaning level.

## *8.3 Materials Working Property Criteria*

Conservation materials to be used within a treatment have *working property criteria* which must be determined within the context of the intervention. Working property criteria refer to the short-term requirements of the materials, separately and in combination, during an intervention. These criteria will be individually discussed below for both the *cleaning agents* and *auxiliary materials*.

### 8.3.1 Solvents

Generally in a cleaning intervention cleaning agents are the solvents, surfactants, chelating agents, reagents, or mechanical removal methods which provide the 'cleaning' action in the intervention. Within the scope of this project however, cleaning agents have been limited to the use of solvents and solvent-based proprietary graffiti-removal products only. The working property criteria for solvents in the intervention are:

- Specificity
- Viscosity
- Volatility
- Good controllability
- Low health and safety risks
- Low environmental risks
- Polarity
- Low surface tension
- Neutral pH (if possible)
- Low cost
- Availability

### 8.3.2 Auxiliary materials

Auxiliary materials are any ephemeral materials used during the intervention to aid in the intervention – in this case, the application of the cleaning agent or clearance of the unwanted, non-original material. For the removal of painted graffiti from mural paintings, two types of auxiliary materials were used: *sorbents* and *intervention layers*.

'In conservation, the term sorbent is used to describe a porous material with the capacity to (Redman 1997; 3):

- Retain a liquid in contact with the object's surface;
- to desorb a liquid into a porous material (known as *desorption*); and
- absorb a liquid from a porous material (known as *absorption*).

Intervention layers have been defined as thin, protective layers applied between the surface of an object and a conservation material to facilitate the treatment and protect the painting (Redman 1997; 4). Typically, their main functions are to:

- reduce the effects of direct, mechanical action on the surface of a wall painting;
- aid in the clearance of a material by acting as a filter;
- assist in the conformance of materials to the object's surface;
- aid in the retention of moisture; and
- help achieve homogeneity of the intervention results.

Within the scope of this project however, the main role of the intervention layer was to aid in clearance of the sorbent materials applied.

Working property criteria of the sorbents and intervention layers with specific reference to the cleaning of graffiti from mural painting surfaces include the following (Redman 1997):

*Table 8.1 Working property criteria for auxiliary materials involved in a cleaning intervention*

| **AUXILIARY MATERIALS** | |
|---|---|
| **Sorbents** | **Intervention Layers** |
| Ease of application | Ease of application |
| Ease of preparation | Good conformance to surfaces |
| Good conformance to surfaces | Not impede the exchange of liquid from sorbent to painting |
| Good absorption and desorption | Good wet strength |
| Translucency vs. opacity | Translucency vs. opacity |
| Affinity with both polar and non-polar systems | Ease of clearance |
| Ease of clearance | Not to leave any residue |
| Not to leave any residue | Low density |
| Low density | Neutral pH |
| Neutral pH | Readily available |
| Readily available | Low cost |
| Low cost | |

Defining the working properties of the auxiliary materials in a specific conservation intervention will aid in the preliminary selection of the materials for testing.

# Section 9: Methodology

## *9.1 Original and Added Materials Characterization*

Due to restrictions in both time and resources, and the sheer number of unknown materials within each and every mural, a thorough investigation into identification of the original and added materials of each case study was not a possibility. Characterization of the materials was instead intended to imitate a real-world investigation of a contemporary mural painting. If maintenance of the LA murals on a large scale is ever to be successfully implemented, time, funding, equipment, and expertise will likely not be available for detailed instrumental analysis of materials. Therefore characterization of materials was limited to preliminary research, *in situ* visual assessment, cross-section microscopy, and limited FTIR and PyGCMS analysis performed on a minimal number of samples from the added materials.

*Table 9.1 Methods of original and added materials assessment*

| | |
|---|---|
| Research | Many of the contemporary mural paintings in Los Angeles and elsewhere are well documented with regard to the original materials.<br>Any conservation or restoration interventions which have been performed are likewise often documented.<br>The artist can often be located and contacted to provide primary information on the painting materials (though they may not be reliable). |
| Visual Assessment | Support material (e.g. cement, brick, wood, etc.) and type (e.g. poured, constructed).<br>Render present?<br>Ground or preparation layer? |
| Cross-section Microscopy | Will help to determine if a coating is present over the original paint surface.<br>If a coating is present, microscopy will shed light on physical characteristics such as thickness, relation to underlying layers, coherence, etc.<br>If a coating is not present, assessing the nature of and physical relationship between the original and graffiti materials is important. |
| FTIR analysis | FTIR analysis was used to identify and distinguish the binding media of two major categories of aerosol paints encountered. Once the range of aerosol paint binding media has been established, simple solubility tests should be able to distinguish the various types in the future. |

## *9.2 Auxiliary Materials Selection Methodology*

Two types of auxiliary materials were used to improve the success of the cleaning trials: intervention layers and sorbents.

### 9.2.1 Intervention layers

Based on the working property criteria set for the use of an intervention layer within the scope of the project (*see Section 8.3.2*), only two types of tissue were identified as satisfying the majority of requirements: Japanese tissue and lens tissue.

*Japanese tissue* is a fine, handmade paper produced from pure cotton cellulose. It is available in various grades of density and fibre length, indicated by the paper weight ($g/m^2$). The material is commonly used in conservation particularly due to its excellent wet strength and conformance properties. The lighter grades of tissue perform best as intervention layers as their absorbency is extremely limited and therefore does not impede the exchange of liquid

(Redman 1997: 15). The product's only drawback is its high cost. One of the lightest grades of Japanese tissue, 9 g/m$^2$, was selected for testing in this project.

*Lens tissue* is a synthetic tissue very similar to Japanese tissue in that it is likewise available in various grades of density and fibre length. Its conformance properties are slightly lower than those of Japanese tissue; however it has greater wet strength properties and is significantly lower in cost and much more readily availability. A similar weight of tissue, 9 g/m$^2$, was selected for testing.

*Table 9.2 Comparative properties of selected intervention layers*

| | Density (g/m$^2$) | Conformance | Wet Strength | Approximate Cost |
|---|---|---|---|---|
| Japanese Tissue 502 | 9 | Excellent | Good | > £1.00 / sheet |
| Lens Tissue | 9 | Good | Excellent | £0.30 / sheet |

### 9.2.2 Sorbents

A number of materials from a wide range of classes were originally selected as potential sorbents for cleaning trials (*see Appendix 2.1*). Initial sorbent selection was made based on the availability of the product and preliminary information gathered from detailed analytical product assessments (Martin de Fonjaudran 2003; Redman 1997; and Curteis 1991).

A further reduction in sorbent materials was necessary prior to implementation of the cleaning trials and therefore the materials underwent preliminary testing to evaluate their properties with regard to the most crucial criteria for use within the scope of this project. Each of the sorbents was prepared to their suggested working consistency, mixed with a dark dye, and applied to a cement test block which was covered with a thick layer of acrylic paint. Testing was aimed at evaluating through observation, the principal sorbent properties with specific reference to their application on acrylic-based murals with cement supports. Properties evaluated include:

- ease of preparation,
- conformance,
- adhesion to the painting surface,
- absorption/desorption properties, and
- sag effect.

## *9.3 Solubility Testing Methodology*

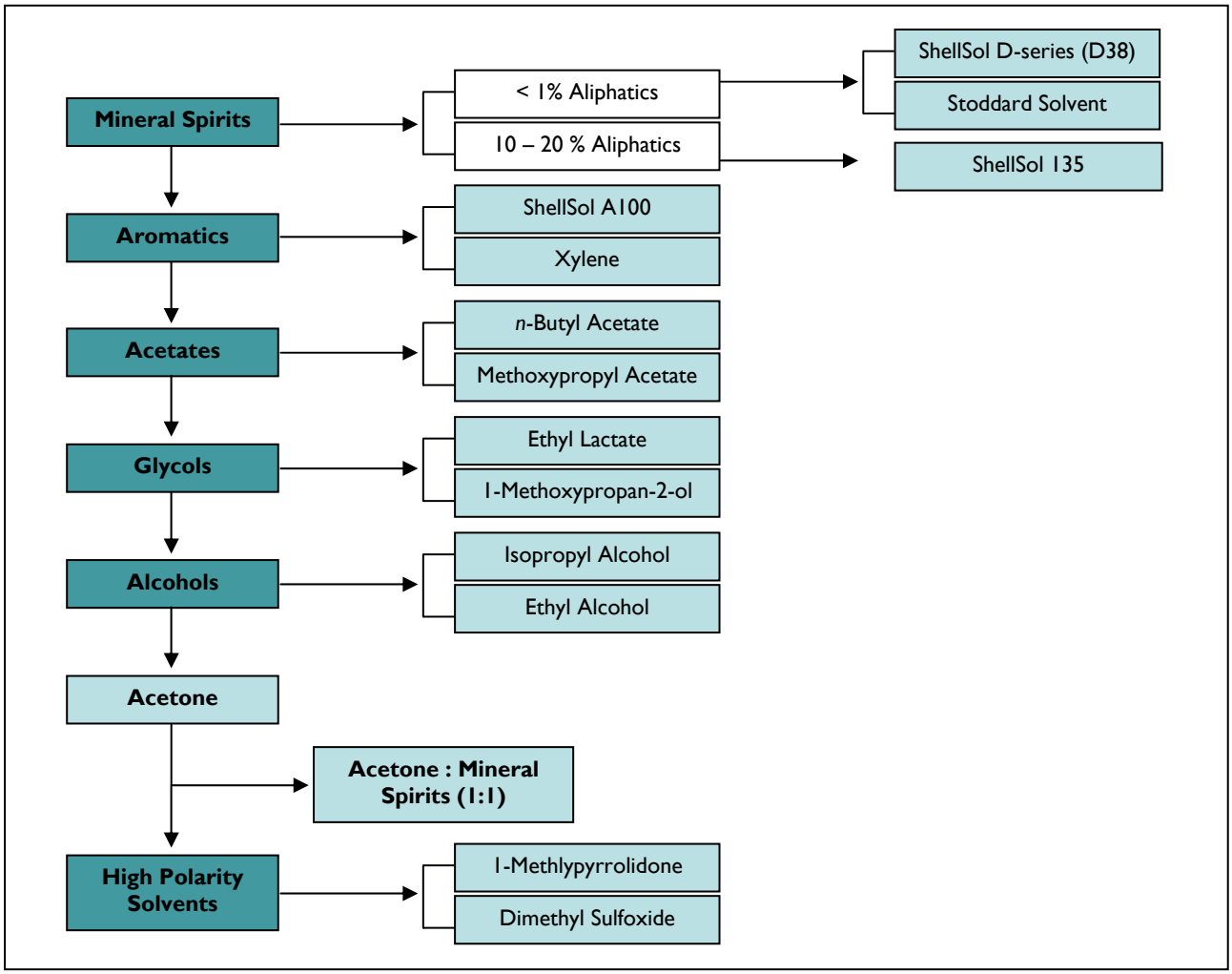
Solubility tests were carried out to establish the region of solubility for both the original paint and graffiti paint materials. Preliminary solubility tests were key to finding a range of organic solvents which would mobilize the unwanted, non-original material and, ideally, not affect the original paint layer. *In situ* solubility tests were aimed at establishing solvent *specificity* for each individual case study, or solvents which would mobilize the graffiti material with minimal effect on the original materials.

### 9.3.1 Preliminary solubility testing and solvent selection

Preliminary solubility tests were carried out initially *ex-situ*. The preliminary tests were performed on the aerosol graffiti paints alone to establish a range of organic solvents which would have a mobilizing effect on the non-original materials.

Testing was carried out on terracotta tiles which had been sprayed with either matte blue or silver metallic *Krylon* spray paint since it was thought the metallic paints could have very different solubility parameters than the matte paints. The painted tiles were aged in natural sunlight for 7 days to insure thorough drying and allow for any potential cross-linking to take place. To simplify the variables during preliminary testing, Krylon was the only aerosol paint used as it was likely to be the most common graffiti type encountered in field testing. A swab was used to individually apply each solvent to the painted surface. The swab was rolled lightly over the surface for a minimum of 30 seconds and any observations or results were noted. After assessing the working property criteria required of the solvents, one or two solvents known to meet the designated criteria were selected from a number of the major solvent groups and applied to the tiles in a progression of increasing polarity (*see Appendix 3.1*).

*Table 9.3 Flow chart detailing the progression of solvents tested from the most non-polar to highly polar solvents*

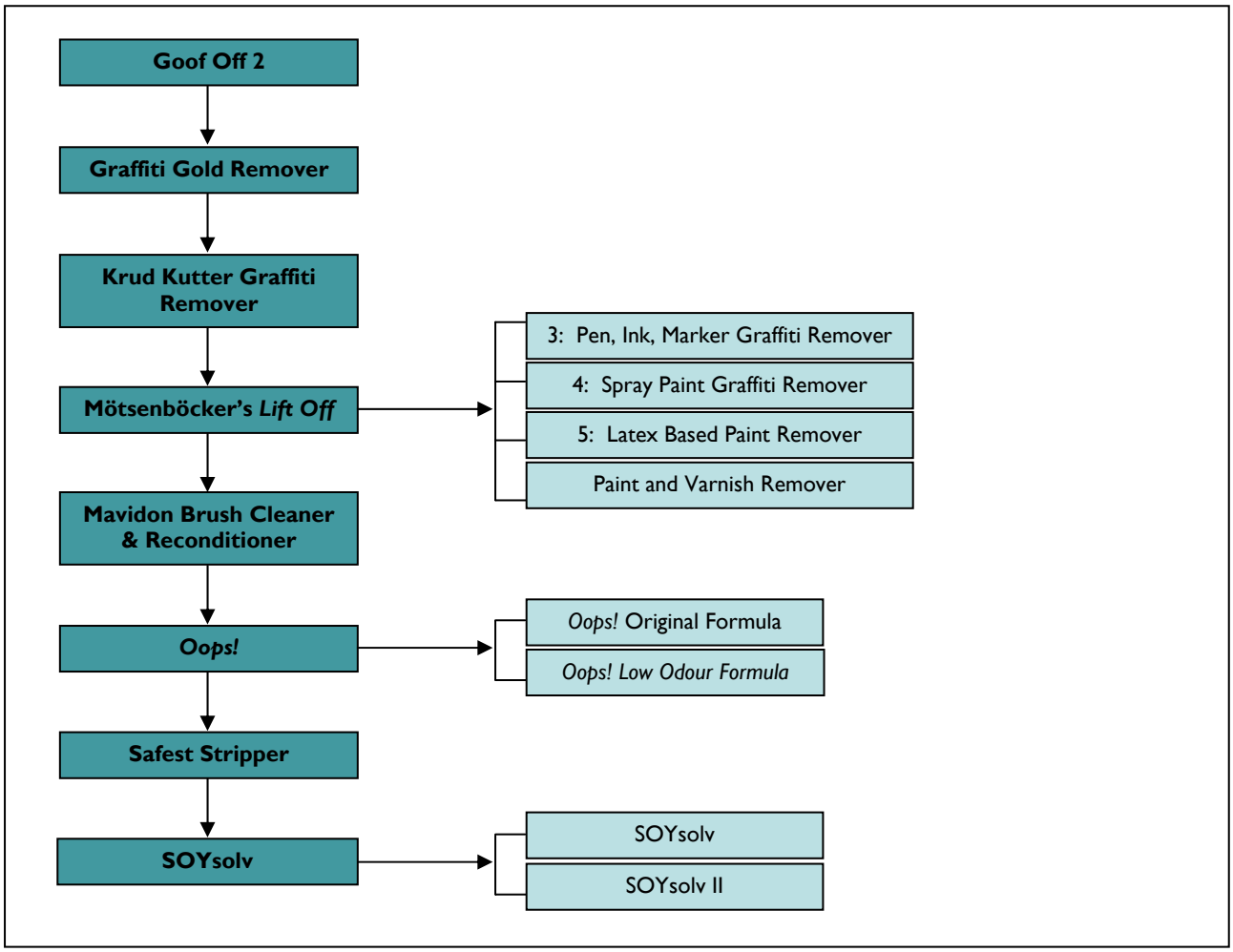



Following preliminary testing, solvents which had no effect on the graffiti material were eliminated while solvents which had a sufficiently mobilizing effect were retained for further testing on site.

A wide rage of proprietary graffiti removal products were similarly tested on the mock paintings for comparative purposes. Products chosen for use consisted of locally available proprietary materials (those available for purchase at hardware stores within Los Angeles)

as well as a number of other products obtained from Leslie Rainer of the Getty Conservation Institute. From this group, the three most successful products during bench tests were also retained for on-site testing.

*Table 9.4 Table shows the proprietary graffiti removal products tested during preliminary solubility testing.*




## 9.3.2 In-situ solubility testing

*In situ* testing was performed in a manner very similar to the preliminary testing. The remaining solvents and proprietary graffiti removal products were applied by swab to the surfaces of the graffiti paint materials in various locations as well as to the original paint layer. Trials were undertaken where the original paint layer was in good condition. Swabs were rolled over a small surface area until a conclusive assessment of the solvent's action on the paint layer could be made (generally 1 minute). Testing methodology was intended to determine the selectivity of the solvents for a range of aerosol paint colours and materials as well as for the original paint layer.

When testing of each of the pure solvents was complete, solvent mixtures were tested in an identical fashion. Selection of solvent mixtures was specific to the individual case study and based on the results of pure solvent solubility testing on that painting.

### 9.3.3 Assessment methodology

Evaluation of solubility tests was accomplished solely through careful visual assessment of the paint layer during and after swabbing. Assessment criteria for testing of the graffiti materials included the following parameters:

- the amount of time required for mobilization of the paint layer to initiate;
- weather or not mechanical action was required to mobilize the paint layer and if so, how much;
- the controllability of paint removal;
- the overall level of removal; and
- the homogeneity of removal.

Assessment of tests for effects on the original paint material included the following two criteria:

- the level of visual impact on the paint layer; and
- the amount of time required for effect to take place.

## *9.4 Cleaning Trial Methodology*

### 9.4.1 Variables of application methodology

The methodology through which the solvent-sorbent system is applied to the surface of a wall painting has a considerable impact on the success of the cleaning treatment. A number of variables of application can be altered to best suit the cleaning issues and materials present in a specific case. The variables of application for a cleaning agent-sorbent system include (Redman 1997: 4):

- the cleaning agent applied;
- the sorbent material through which the cleaning agent is applied;
- the amount of cleaning agent added to the sorbent (concentration);
- the thickness of sorbent layer applied;
- the duration the cleaning agent is in contact with a surface;
- the use of an intervention layer;
- the sequence of application;
- the control of evaporation of the liquid from the sorbent (e.g. application of an impermeable covering over the sorbent surface); and
- the clearance methodology.

To find the most successful cleaning system for each case study, each of the above variables were systematically altered to produce a number of different combinations for trials.

Proprietary graffiti materials were applied only according to manufacturer instruction.[9]

[9] 'Most graffiti can be removed without damaging the masonry with proprietary graffiti-removal products and commercial paint strippers containing organic solvents. But, these products should always be tested and used in accordance with manufacturer's instructions included in the product literature (Weaver 1995: 4).'

### 9.4.2 Cleaning trial assessment methodology

Assessment of the cleaning trials undertaken was performed in two ways: *in situ* visual assessment and *ex-situ* analytical assessment.

#### *In situ assessment*

Individual trials were assessed visually both during and after cleaning. Assessment was based on the visual observations of the following criteria:

- the application time required to sufficiently mobilize the graffiti material for removal;
- the amount of mechanical action required to remove the swollen graffiti layer;
- the controllability of the system;
- the overall level of graffiti removal;
- the homogeneity of graffiti removal;
- the impact of cleaning on the original paint layer; and
- the amount of time before the cleaning system began to impact the original paint layer.

Ideally, cleaning aimed to fully remove all graffiti paint present without affecting the original paint layer or any other original materials.

#### *Documentation:*

Macro digital images in both normal and raking light were taken before and after each cleaning trial to assist in assessment. Often, the image captured in raking light demonstrated inhomogeneity of the cleaning trial or damage caused to the original paint surface which was otherwise not readily apparent.

#### *Ex-situ Assessment*

Three types of analysis were used to assess the results of cleaning trials by examining and comparing the physical nature of the paint layer before and after cleaning.

A well-developed and methodical sampling strategy was crucial to achieving informative results from the analysis to follow. To assess the results of a single cleaning trial, a series of three small paint samples was taken from the trial area for comparative purposes: [1)] an un-cleaned, non-graffitied, original paint layer sample; [2)] an un-cleaned, graffitied paint sample; and [3)] a cleaned paint layer sample. The samples were each divided into smaller sections for use in all three types of analysis.

*Cross-section microscopy:*

A small section of each sample was made into a cross-section and evaluated under high magnification with a binocular microscope. The physical nature of the paint layer before and after cleaning was easily compared in this manner and assessed by the following criteria:

- Complete removal of the graffiti material?
- Visible damage to or thinning of the original paint layer?
- Visible damage to or thinning of a protective coating (if present)?

*Scanning electron microscopy:*
The samples were further assessed topographically with a scanning electron microscope (SEM). With the SEM the sample surface was examined and recorded at various high magnifications, allowing subtle differences in surface condition to become apparent.

## *9.5 Analysis*

### 9.5.1 Fourier transform infrared spectroscopy

Fourier transform infrared spectroscopy (FTIR) was used to identify the coating material on *The Bride and Groom* and the binding media of two samples of aerosol paint from the surface of each case study. Since innumerable types and colours of aerosol paint were visible on the murals, not all could be analyzed. Therefore, the analysis was undertaken on only a few samples to establish a range of graffiti paint materials which might be encountered on the murals' surfaces. Prior to sampling, solubility tests were carried out to distinguish a more-soluble graffiti paint material from a less soluble type so one of each could be sampled and analyzed in an attempt to characterize the cleaning responses of the materials.

### 9.5.2 Pyrolysis gas chromatography mass spectrometry

Pyrolysis gas chromatography mass spectrometry (PyGCMS) was similarly carried out on select graffiti paint samples where further information was desirable following the results of FTIR analysis. PyGCMS was carried out on four samples in total.

# Section 10: Results

## *10.1 Original and Added Materials Characterization*

Results of the original materials characterization for each case study are summarized in Table 10.1 (*see Appendices 4.2.1, 4.3.1, 4.4.1 and 4.5.1 for further details*). Results were obtained through visual assessment of the murals, personal communication with the artists, and existing documentation (*see Appendices 4.3.9, 4.4.9, and 4.5.9*).

*Table 10.1 Summary of the original materials of each case study.*

| **Original Materials** | | | | | |
|---|---|---|---|---|---|
| *Case Study* | *Support* | *Ground Layer* | *Paint Layer* | *Original Coating* | *Source* |
| *102* | Poured cement | *Sinclair Acra Vin* house paint primer, white | Groom: *Acra Vin* paint Bride: *Nova Color* pure acrylic artists' paints, possibly mixed with a small amount of rhoplex | *Nova Color* gloss medium & varnish | *PC* Twitchell 2007 |
| *104* | Poured cement | Unknown | *Dunn and Edward's* acrylic paint | Date of coating unknown | LACAD 2002; Several 2000 |
| *105* | Poured cement | Artist grade acrylic 'gesso' | Artist grade acrylic paint | Date of coating unknown | *PC* Sellers 2006; LACAD 1999 |
| *106* | Poured cement | Water-based acrylic paint, white | Water-based acrylic paint and aerosol paint | None | *PC* Quezada 2007; LACAD 1993 |

The added or non-original materials encountered on each mural were found to consist of a protective coating and graffiti paint in each case with the exception of Quezada's painting (106) which was found to be uncoated. The binding media of two graffiti paint samples from each case study were identified with FTIR analysis and some PyGCMS when necessary. Results of the characterization are summarized in table 10.2. (*For more detailed results of the analysis refer to Appendix 5.1*).

*Table 10.2 Summary of the added materials encountered on the surface of each mural case study*

| **Added Materials** | | |
|---|---|---|
| *Case Study* | *Coating* | *Graffiti Paint (binding media) (see Appendix 5.1)* |
| 102 | *Nova Color* gel medium - applied to the lower section of the painting in the late 1970s. (identified as polyvinyl acetate (PVA) by FTIR analysis) | *More-soluble sample:* Isophtalic alkyd resin probably modified by addition of a small amount of acrylic. *Less-soluble sample:* Vinyl toluene (VT) – modified alkyd resin. |
| 104 | Waxy Coating (*see Appendix 4.3.9*) | *More-soluble sample:* Styrene acrylic copolymer |

| | | |
|---|---|---|
| | | *Less-soluble sample:* Alkyd resin. |
| | | |
| 105 | Acrylic Coating (see *Appendix 4.4.9*) (However, coating appears in cross-sections to be present under a number of successive paint layers as if the mural has been repainted since its application.) | *More-soluble sample:* Nitrocellulose resin.<br>*Less-soluble sample:* Alkyd resin. |
| | | |
| 106 | None | *More-soluble sample:* Acrylic copolymer of methyl methacrylate and *n*-butyl methacrylate, with a VT-modified orthophthalic alkyd resin.<br>*Less-soluble samples:* Alkyd resin. |

## *10.2 Auxiliary Materials Selection*

*Refer to Figures 10.1 and 10.2*

### 10.2.1 Intervention layers

As only two types of intervention layers were considered for use within the project, their assessment was easily undertaken *in situ* during initial cleaning trials. Both the Japanese tissue and lens tissue were used in conjunction with various sorbent materials and on a range of topographically variant surfaces. The two materials were found to be comparable in their application behaviour within the current project. *Lens tissue* was therefore chosen for use as it is much more widely available than the Japanese tissue and can be purchased at a fraction of the cost.

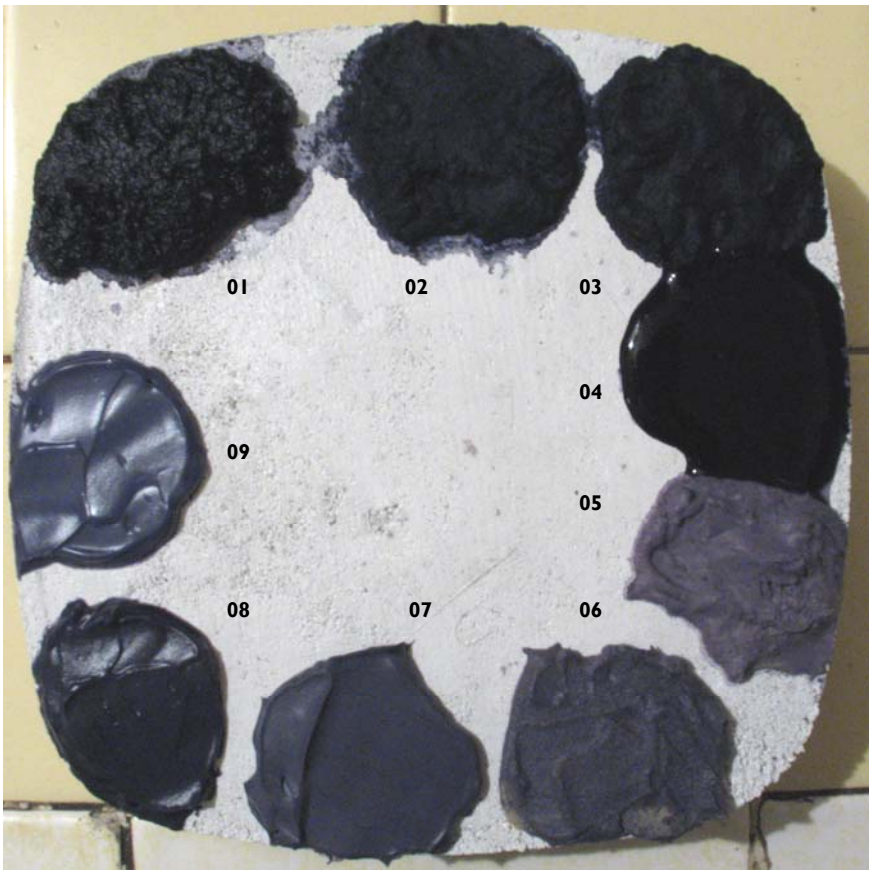
### 10.2.2 Sorbent materials

The sixteen sorbent materials initially assessed were subjected to preliminary, *ex-situ* testing (*Figures 10.1 and 10.2*) (*see Appendix 2.1*). Based on the results of testing, ten materials were eliminated while only 6 were retained for further use.

*Table 10.3 Summary of the results of preliminary sorbent testing.*

| Sorbent Material | Assessment of Preliminary Testing | Results |
|---|---|---|
| Carbogel | Excellent results at 3% concentration. | Retained |
| Sepiolite | Excellent results at 60% concentration. | Retained |
| Dicalite SA3 | Poor handling properties – difficult to apply and does not stay in place when applied to a vertical surface. | Eliminated |
| Pangel S15 | Excellent results at 15% concentration. | Retained |
| Pangel S9 | Excellent results at 15% concentration, but physical properties virtually indistinguishable from Pangel S15. | Eliminated |
| Pansil 400 | Excellent results at 40% concentration, but physical properties extremely similar to those of Pangel S15 & S9 except a much larger quantity of the product required for same results. | Eliminated |
| Arbocel BC200 | Some lateral desorption of liquid observed. | Eliminated |
| Arbocel BWW40 | Some lateral desorption of liquid observed. | Eliminated |
| Arbocel B800 | Ability to hold higher concentration of liquid with less lateral desorption than other types of Arbocel tested. | Retained |
| Klucel PR | Extremely difficult to prepare for use. | Eliminated |
| Benecel M-043 | Extremely difficult to prepare for use. | Eliminated |
| WypALL X60 | Poor adhesion to acrylic paint surface. | Eliminated |
| WypALL X70 | Good results | Retained |
| WypALL L30 | Difficult to manipulate when wet and poor adhesion to acrylic paint surface. | Eliminated |
| Contec C2 | Good results | Retained |
| Whatman blotting paper | Poor conformance to surface observed. | Eliminated |

**Figures 10.1 (below left) and 10.2 (below right):** *The images below depict the results of preliminary, ex-situ testing of sorbent materials.* **Photos: Courtauld Institute CWPD 2007**





*01. Arbocel BC200; 02. Arbocel BWW40; 03. Arbocel B800; 04. Klucel PR; 05. Dicalite SA3; 06. Sepiolite; 07. Pansil 400; 08. Pangel S15; 09. Pangel S9; 10. Contec C2; 11. Carbogel 2%; 12. WypALL L30; 13. WypALL X70; 14. WypALL X60.*

## *10.3 Solubility Test Results*

*Refer to Figures 10.3 to 10.13*

### 10.3.1 Preliminary solubility test results

Of the 15 pure solvents tested during preliminary, *ex-situ* solubility testing, 6 were observed to have sufficient mobilizing power on the aerosol paint material, although slightly less effective on the metallic paint than the matte (*Figures 10.3 and 10.4*). These 6 solvents were retained for *in situ* testing (see *Appendix 3.2*):

- Acetone,
- *n*-Butyl Acetate,
- Ethyl Lactate,
- 1-Methoxypropan-2-ol (MP),
- Methoxypropyl Acetate (MPA), and
- 1-Methylpyrrolidone (NMP).

All other solvents tested were observed to have no mobilizing effect on the aerosol paint or to produce undesired visual effects such as blanching. Preliminary solubility testing helped to establish a general region of solubility for the aerosol paint materials which can be plotted on the *Tea's* chart for visual reference (*Figures 10.7 and 10.8*).

Although observed to have insufficient mobilizing power on the graffiti material, Stoddard solvent and *d*-Limonene were however retained for *in situ* use as potential components of solvent mixtures.

Of the thirteen proprietary graffiti removal products tested, the majority were observed to have very little mobilizing effect on the aerosol paint materials (*Figures 10.5 and 10.6*). The three most successful products were chosen for testing on the mural paintings (see *Appendix 3.2*):

- Graffiti Gold Remover ™,
- Mavidon Brush Cleaner & Reconditioner ™, and
- Mötsenböcker's *Lift Off* 4 ®.

### 10.3.2 *In situ* solubility test results

For each case study, the various graffiti paints encountered on the painting surfaces were found to be affected differently by the range of cleaning agents selected for trials. The graffiti paints can be roughly divided into two general groups based on these reactions to the solvents: [1)] paints which are fairly easily mobilized by each of the solvents and proprietary graffiti removal product selected from lab solubility testing, and [2)] paints which are only mobilized to a minor extent by the selected solvent and removal product range. Due to the difficulty in specifically identifying each of the myriad paints present and for the purpose of simplicity, the groups will henceforth be referred to respectively as *more soluble* and *less soluble* materials. Based on the results of analysis, it is likely that the materials in the more soluble group are mainly acrylic or cellulose nitrate-based paints, while those in the less soluble group are likely to be alkyd or polyurethane based. Interestingly, in every case on-site, solubility testing indicated that the metallic aerosol paints fell into the more soluble category, while the matte paints were split between the more and less soluble categories.

### *Case Study 1 (102) – The Bride and Groom, Kent Twitchell*

Solubility tests and cleaning trials on *The Bride and Groom* (*Figures 10.9 and 10.10*) were very much complicated by the presence of a thick coating (*Figures 10.11 to 10.13*). Trials aimed to achieve an overall level of homogeneity within the mural and therefore both a solvent and application methodology had to be adapted which would remove the graffiti paint without removing or thinning the coating. Doing so was an important aspect of retreatability so that if and when the coating is removed in the future, the level of removal required from area to area is uniform. Furthermore, since the re-application of a coating following trials was not a possibility, cleaned areas needed to retain their coating so that the original paint layer was not exposed to likely future acts of vandalism.

During solubility tests the more soluble graffiti paints were found to be easily mobilized by each of the solvents selected for on-site testing. Of this group, MP and MPA were observed to mobilize the graffiti paint with little or no effect to the original materials and coating. Of the three proprietary graffiti materials tested, the Graffiti Gold Remover ™ was found to have the most mobilization power. (*See Appendix 4.2.5*)

The less soluble graffiti paints however were extremely difficult to mobilize with any of the available solvents or proprietary removal products. MEK, which was tested as a last resort, was the only solvent observed to have a significant effect on the graffiti paint layer; however, mobilization was still only possible with extensive mechanical action and caused severe damage to the coating and original paint materials. (*See Appendix 4.3.5*)

### *Case Study 2 (104) – Flow Inversion, Judith Von Euer*

Of the pure solvents tested on *Flow Inversion*, MP and MPA were again observed to have the best mobilization effect on the more soluble graffiti paints; however, it appeared that they caused some visible damage to the original paint layer. In an attempt to reduce solvent action on the original materials, various solvent mixtures were tested. Mixtures of MP:Stoddard Solvent:NMP (7:7:1) and MPA:Stoddard Solvent:NMP (7:7:1) were found to have equivalent mobilization power on the graffiti material but affected the original paint materials to a significantly lesser extent. Of the proprietary graffiti removal products tested, Graffiti Gold Remover ™ was again found to have the most successful results on the more soluble type of graffiti paint (*see Appendix 4.3.5*).

Again, the less soluble graffiti paints were extremely difficult to mobilize sufficiently. Of all the solvents, products, and mixtures tested, the following showed potentially significant results (*see Appendix 4.3.5*):

- NMP;
- *d*-Limonene : NMP (4:1);
- MPA : Stoddard Solvent : NMP (7:7:1); and
- MPA : Stoddard Solvent : NMP (7:2:1).

### *Case Study 3 (105) – Untitled (Elysian Park), Janet Sellers and James Garcia*

Solubility tests on the paintings at Elysian Park were extremely difficult as each of the solvents tested (including pure water) were observed to have some negative visual impact on the original paint layer. Therefore, solubility tests were evaluated on the solvents *potential* to have a minimal effect on the original paint materials when appropriately applied.

Solvents which demonstrated best results with regard to removal of the more soluble graffiti material include the following (*see Appendix 4.4.5*):

- MP;
- MPA : Stoddard Solvent : NMP (7:7:1);
- MPA : Stoddard Solvent : NMP (7:2:1); and
- Acetone : Stoddard Solvent : NMP (7:2:1).

Of the proprietary graffiti removal products, only Mötsenböcker's *Lift Off* 4 ® was able to mobilize the more soluble graffiti paint to some extent before severely damaging the original paint layer (*see Appendix 4.4.5*).

Again, none of the cleaning agents tested on the less soluble graffiti paints was able to completely mobilize the graffiti. NMP was the only solvent to demonstrate enough mobilization power to be potentially successful in application.

### *Case Study 4 (106) – Untitled (3400 N. Figueroa), Peter Quezada*

The mural painting at 3400 N. Figueroa Street was the only mural found to be covered mainly in the less soluble form of graffiti paint. This, plus the fact that the original paint layer was particularly weak, made solubility tests extremely difficult. As in the case of the Elysian Park mural, all solvents – including water – applied to the original paint surface had an undesirable visual impact (*see Appendix 4.5.5*).

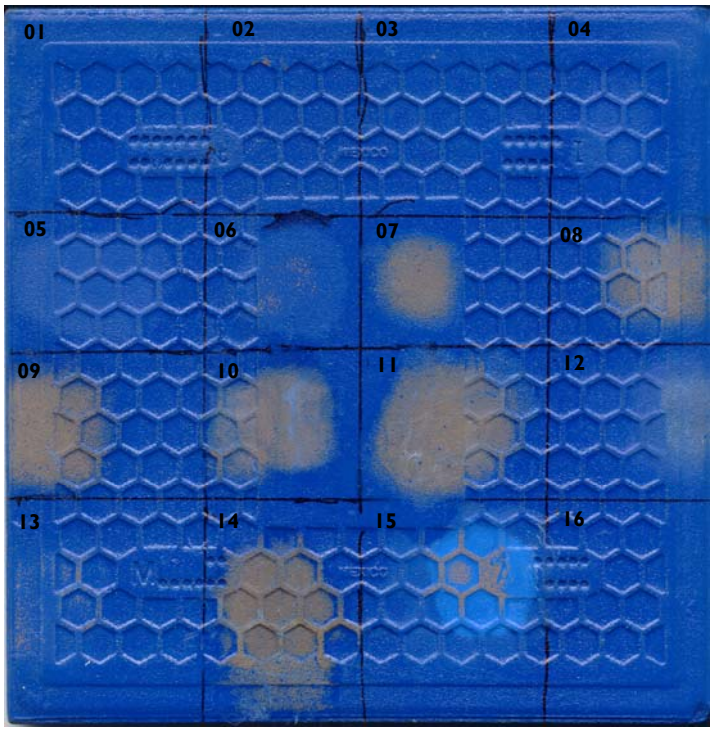
A solvent mixture of MP:Stoddard Solvent:NMP (7:7:1) produced the most successful results with regard to the limited amount of more soluble graffiti material encountered. The less soluble graffiti paints were found to be extremely susceptible to acetone when fully saturated. A mixture of MP:Stoddard Solvent:NMP (7:2:1) was the only other solvent found to produce potentially successful results. None of the proprietary graffiti removal products was able to mobilize either group of graffiti materials sufficiently (*see Appendix 4.5.5*).

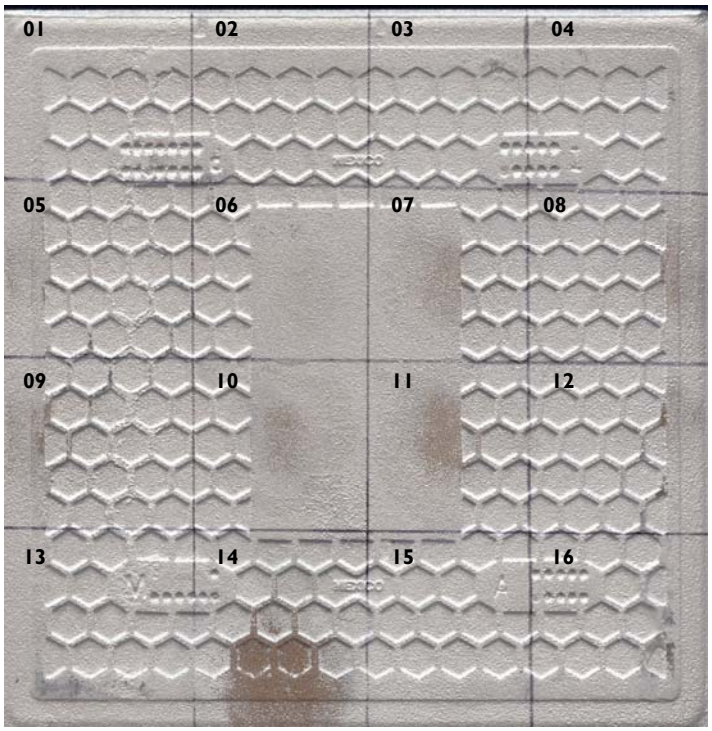
*Table 10.4 Summary of results from in situ solubility tests for all case studies.*

| ***Case Study*** | ***More soluble graffiti paint group*** | ***Less soluble graffiti paint group*** |
|---|---|---|
| 102 | MP<br>MPA | MEK |
| | Graffiti Gold Remover ™ | Unaffected by proprietary graffiti removal products |
| 104 | MP *: Stoddard Solvent : NMP (7:7:1)*<br>MPA : Stoddard Solvent : NMP (7:7:1) | NMP<br>*d*-Limonene : NMP (4:1)<br>MPA : Stoddard Solvent : NMP (7:7:1)<br>MPA : Stoddard Solvent : NMP (7:2:1) |
| | Graffiti Gold Remover ™ | Unaffected by proprietary graffiti removal products |
| 105 | MP,<br>MPA : Stoddard Solvent : NMP (7:7:1),<br>MPA : Stoddard Solvent : NMP (7:2:1),<br>Acetone : Stoddard Solvent : NMP (7:2:1). | NMP |

| | | |
|---|---|---|
| | Mötsenböcker's *Lift Off* 4 ® | Unaffected by proprietary graffiti removal products |
| 106 | MP:Stoddard Solvent:NMP (7:7:1) | Acetone<br>MP:Stoddard Solvent:NMP (7:2:1) |
| | Unaffected by proprietary graffiti removal products | Unaffected by proprietary graffiti removal products |

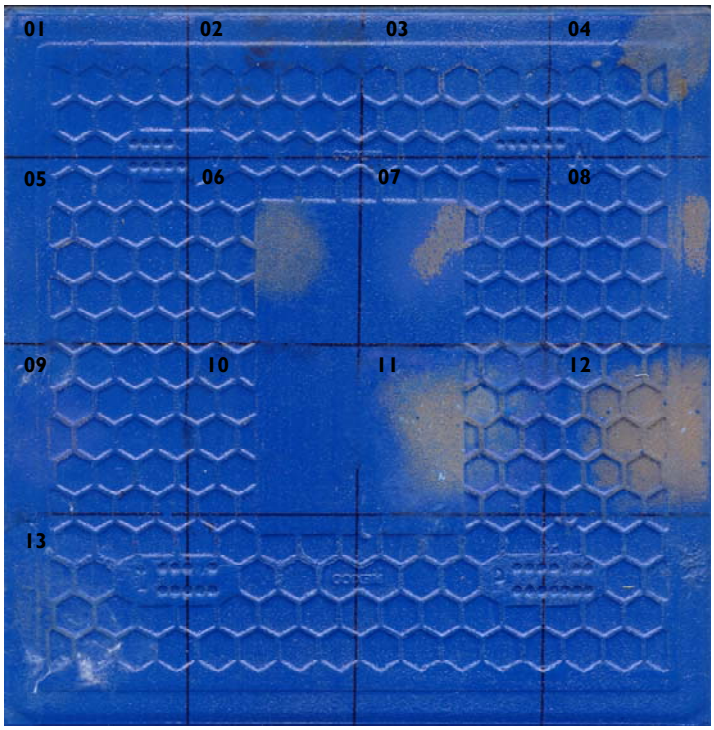
**Figures 10.3 (below left) and 10.4 (below right):** *The images below depict the results of preliminary, ex-situ solubility testing with known solvents on two different colors of Krylon aerosol paint. It is evident here that each of the tested solvents had a greater effect on the matte paint than the metallic paint.* **Photos: Courtauld Institute CWPD 2007**

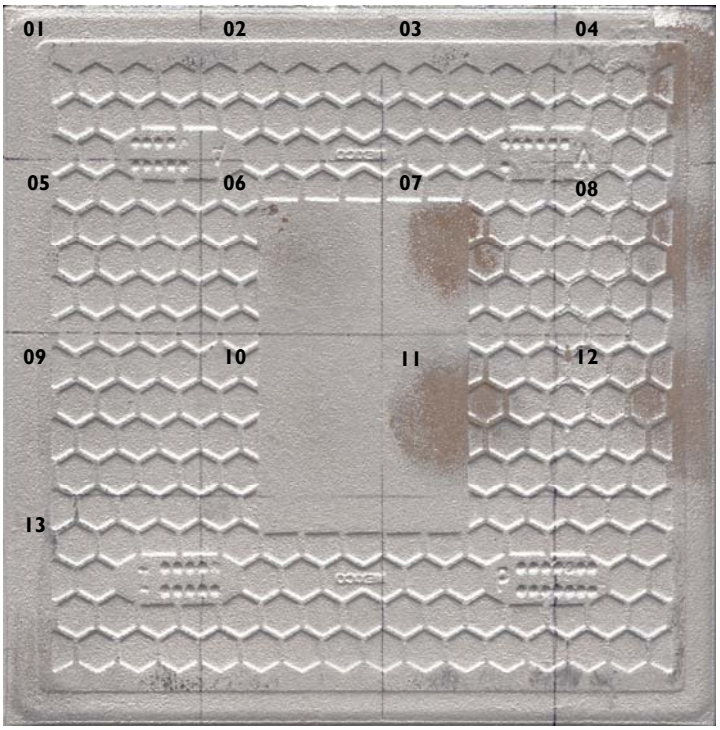



*01. ShellSol D38; 02. ShellSol 135; 03. Stoddard Solvent; 04. ShellSol A100; 05. Xylene; 06. Isopropyl Alcohol; 07. n-Butyl Acetate; 08. MP; 09. Ethyl Lactate; 10. Acetone; 11. MPA; 12. Acetone : Stoddard Solvent; 13. Ethyl Alcohol; 14. NMP; 15. DMSO; 16. d-Limonene.*

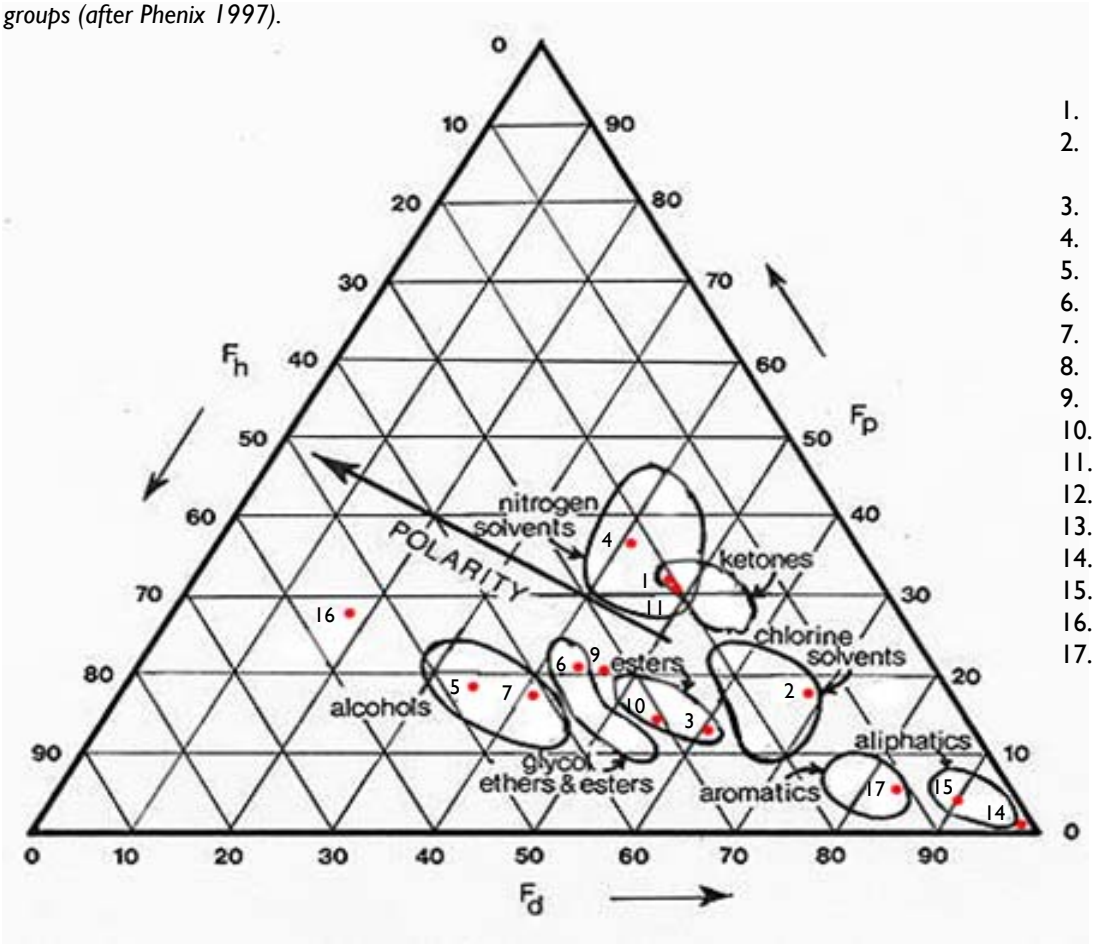
**Figures 10.5 (below left) and 10.6 (below right):** *The images below depict the results of preliminary, ex-situ solubility testing with a range of proprietary graffiti-removal products on two different colors of Krylon aerosol paint. The products appear to have mobilized the matte and metallic paints in each case to a similar extent.* **Photos: Courtauld Institute CWPD 2007**




*01. SOYsolv ®; 02. SOYsolv II ®; 03. Mötsenböcker's Lift Off 3 ®; 04. Mötsenböcker's Lift Off 4 ®; 05. Mötsenböcker's Lift Off 5 ®; 06. Mötsenböcker's Lift Off Paint & Varnish Remover ®; 07. Oops! Original Formula ®; 08. Oops! Low Odour Formula ®; 09. Krud Kutter Graffiti Remover ®; 10. Goof Off 2 ®; 11. Graffit Gold Remover ™; 12. Mavidon Brush Cleaner & Reconditioner ™; 13. Safest Stripper ™.*

**Figure 10.7:** *Teas chart showing the individual solvents used for preliminary solubility testing and the approximate location of family groups (after Phenix 1997).*




1. Acetone
2. Acetone : Stoddard Solvent (1:1)
3. *n*-Butyl Acetate
4. Dimethyl Sulfoxide
5. Ethyl Alcohol
6. Ethyl Lactate
7. Isopropyl Alcohol
8. *d*-Limonene
9. 1-Methoxypropan-2-ol
10. Methoxypropyl Acetate
11. 1-Methylpyrrolidone
12. ShellSol 135
13. ShellSol A100
14. ShellSol D38
15. Stoddard Solvent
16. Water
17. Xylene

**Figure 10.8:** *Teas fractional solubility diagram showing the general solubility region for aerosol graffiti paint as determined by preliminary solubility testing.*

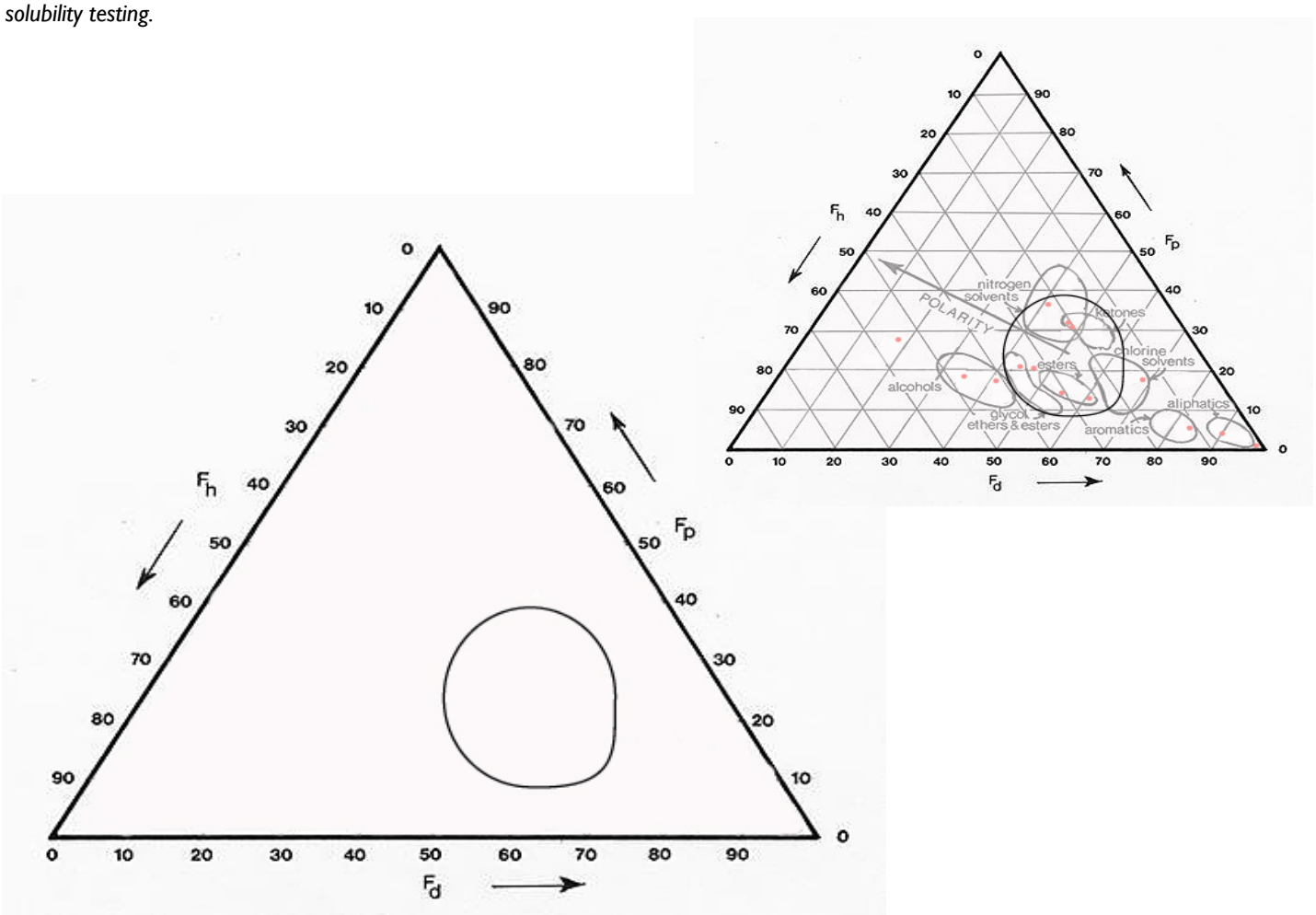



**Figure 10.9:** *'The Bride and Groom' by Kent Twitchell (1972-76) and 'El Nuevo Fuego' by East Los Streetscapers (1985), Northeast exterior wall of The Victor Clothing Company building, 240 S. Broadway St. in Downtown Los Angeles, California.* **Photo: Courtauld Institute CWPD 2007**

**Figure 10.10:** *'The Bride and Groom'. Overview of the mural as it appears today with heavy graffiti paint covering the lower region.* **Photo: Courtauld Institute CWPD 2007**

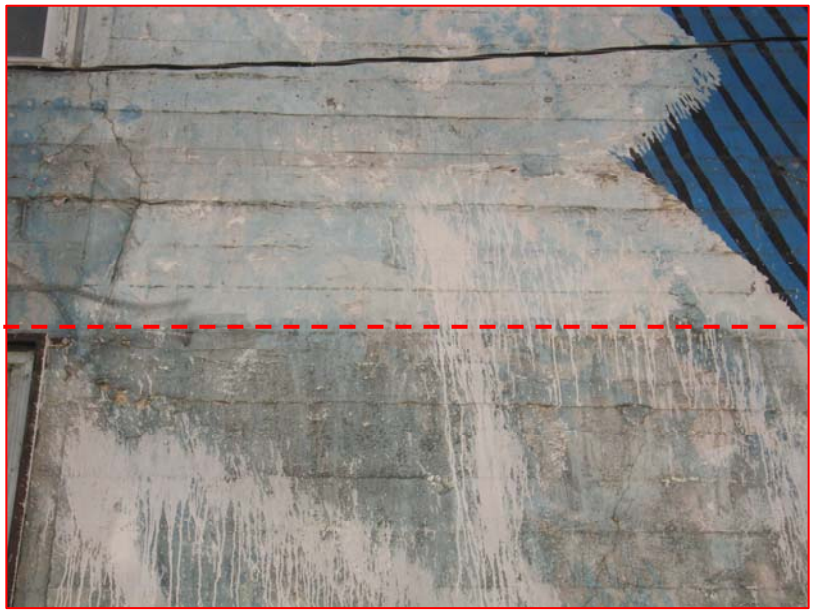
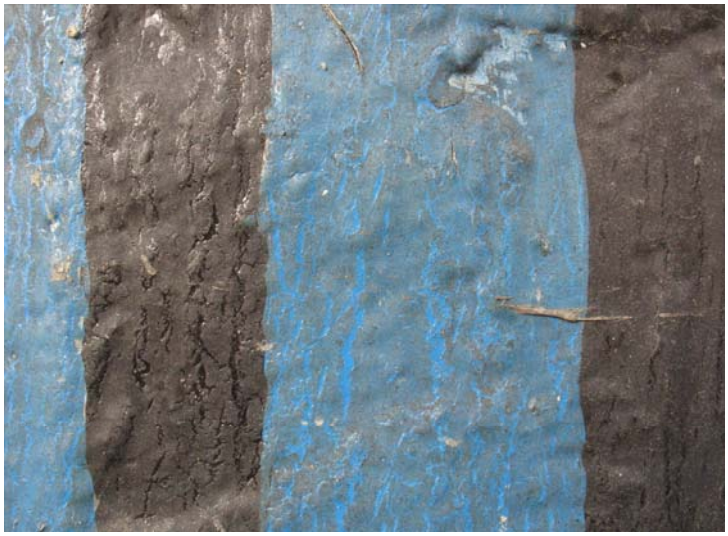
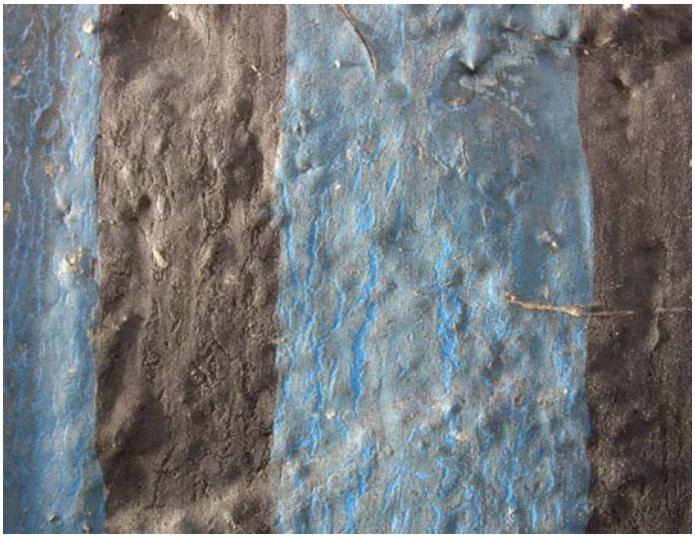


**Figure 10.11 (left):** *The thick gel medium was applied as a coating to the lower half of the mural surface in the late 1970s to protect the surface from graffiti vandalism. Due to its low glass transition temperature the coating has attracted dirt and pollution causing a darkened appearance.* **Photo: Courtauld Institute CWPD 2007**





**Figures 10.12 (above left) and 10.13 (above right):** *Macro images of the thick coating in normal (left) and raking (right) light demonstrate that it has contracted over time, producing a network of fine vertical cracks which expose the original paint surface beneath.* **Photo: Courtauld Institute CWPD 2007**

## *10.4 Cleaning Trial Results*

### 10.4.1 Sorbent and intervention layer use

During the implementation of cleaning trials, a number of general observations were made with regard to the use of auxiliary materials. These results were typically not specific to the case studies, but rather general to application within the scope of the overall project.

#### *Sorbents*

- *Arbocel B800* was found to be the most successful method of application in most cases since it could be easily removed section by section from the mural surface, allowing for full clearance of the graffiti material before solvent evaporation occurred and caused the paint to re-solidify. Furthermore, the Arbocel could be completely cleared from the painting surface without an intervention layer, the use of which proved problematic in itself.
- *Carbogel* could only be successfully applied to the murals when cleaning a small surface area. When applied large-scale, the poultice was unable to adhere to the vertical surface as the graffiti material became slippery upon swelling. Carbogel was therefore only successfully applied to the Elysian Park mural (105) where small-scale treatments were necessary due to the nature of the thin graffiti marks encountered and the short application time required.
- *Sepiolite* and *Pangel* were each unable to hold enough of the solvent mixtures tested to fully swell the graffiti layer(s), making complete removal impossible.
- *Absorbent tissues* were likewise found unable to desorb enough solvent into the graffiti materials to successfully swell them for removal unless the solvent was continuously applied to the tissue (e.g. with a brush), in which case controllability of the system was entirely lost.
- Sorbents in all cases were unable to absorb the swollen graffiti paint material, requiring the introduction of a secondary method for clearance.

#### *Intervention layer*

- The use of an intervention layer was problematic for exterior use as it was extremely difficult to apply successfully in windy conditions. Small sections (approximately 10 $cm^2$) were more successfully applied which was useful at times since the typically short application and clearance times required restricted working areas.

### 10.4.2 Case studies

Due to the large number of variables involved in the cleaning of graffiti from a painted surface (e.g. extent and range of graffiti materials, original materials, solvents, application methodology, etc.), each case study required the execution of numerous cleaning trials. For this reason, the results of each and every cleaning trial will not be discussed here, but a more detailed account of trials can be found in *Appendices 4.2.6, 4.3.6, 4.4.6,* and *4.5.6*.

#### *Case Study 1 (102) – The Bride and Groom, Kent Twitchell*

*Refer to Figures 10.14 to 10.42*

##### *In situ Assessment*

Overall, three cleaning systems were developed which successfully removed the graffiti paint without observable damage to the original materials (*see Appendix 4.2.6*). The successful systems are summarized in table 10.5.

*Table 10.5 Summary of successful cleaning systems developed for the removal of graffiti from 'The Bride and Groom' (102).*

| Cleaning System | | Pros. | Cons. |
|---|---|---|---|
| *Cleaning System 1 - Trial 102-T.12 (Figures 10.15 to 10.17)* | | | |
| *Application* | Arbocel B800 / MP (3 min.) | - Complete removal of graffiti<br>- No thinning or damage to coating or original materials<br>- Not excessively time consuming | - Only applicable to more soluble graffiti materials<br>- Not successful universally across painting surface |
| *Clearance* | Swabbing with MPA:Stoddard Solvent (1:2) | | |
| *Cleaning System 2 - Trial 102-T.19 (Figures 10.18 to 10.20)* | | | |
| *Application* | Swabbing with MPA:Stoddard Solvent:Acetone (7:14:15) | - Complete removal of graffiti<br>- Possible minimal thinning of coating, but no damage to original materials<br>- Successful on all more soluble graffiti types | - Extremely time consuming<br>- Only applicable to more soluble graffiti materials |
| *Clearance* | N/A | | |
| *Cleaning System 3 - Trial 102-T.20 (Figures 10.21 to 10.22)* | | | |
| *Application* | Sponge with hot water (aprox. 60-80˚C) (1 min.) | - Complete removal of graffiti<br>- removal of both more and less soluble graffiti types<br>- Successful universally across painting surface<br>- Treatment extremely fast | - *Hotsy* or other hot water washer required for large-scale treatment<br>- Removes the coating<br>- Reapplication of coating must be possible directly following cleaning |
| *Clearance* | Mechanical action: sponge with hot water | | |

Although trial *102-T.12* was extremely successful in one area, it could not be adapted to function successfully in any other area and therefore the system was eliminated without further evaluation.

*Other results and observations (see Appendix 4.2.6):*

- The proprietary graffiti removal product tested, Graffiti Gold Remover ™ (*102-T.21*), was found to remove the more soluble graffiti almost completely, however the

removal was rather inhomogeneous, uncontrollable, and damaging to both coating and original materials.

### *Analysis*

The results of cleaning trials *T.19* and *T.20* were assessed through analytical techniques off-site. Analysis aimed to help compare the results obtained from each trial and assess the results at a microscopic level.

*Cross-section microscopy (Figures 10.23 to 10.27 and 10.34 to 10.42):*

- A few remaining graffiti paint particles were observed on the *T.19* sample surface indicating incomplete removal, while the graffiti material appears to have been completely removed in *T.20*.
- The coating remains visibly intact and thick in *T.19*, indicating that cleaning did not thin or damage it detrimentally; while it appears to have been completely removed in *T.20* as it is only visible in crevices of the original paint layer.
- No visible signs of damage to the original materials are apparent in either case.

*Scanning Electron Microscopy (Figures 10.28 to 10.33):*
(only performed on *T.20* samples since hot water alone at the correct temperature should have no visible detrimental impact on the original paint layer).

- No deformation or damage to the cleaned sample surface was observed (e.g. cracking, shrinking, or erosion).
- A strange scaling of the cleaned coating surface was observed where the coating had previously accumulated into a thick drip.


**Figure 10.14:** *Sites of successful cleaning trials (A) 102-T.12, (B) 102-T.19, and (C) 102-T.20.* **Photo: Courtauld Institute CWPD 2007**

**Figures 10.15 (above left) and 10.16 (above right):** *Site of trial 102-T.12; pre-cleaning (left) and post-cleaning (right).* **Photo: Courtauld Institute CWPD 2007**

**Figure 10.17:** *Detail; results of cleaning trial 102-T.12 showing excellent removal of the more soluble yellow and black graffiti paint but with no effect on the less soluble white and pink graffiti paints.* **Photo: Courtauld Institute CWPD 2007**

**Figures 10.18 (above left) and 10.19 (above right):** *Site of trial 102-T.19; pre-cleaning (left) and post-cleaning (right).* **Photo: Courtauld Institute CWPD 2007**

**Figure 10.20:** *Detail; results of cleaning trial 102-T.19 on the more soluble graffiti paint.* **Photo: Courtauld Institute CWPD 2007**

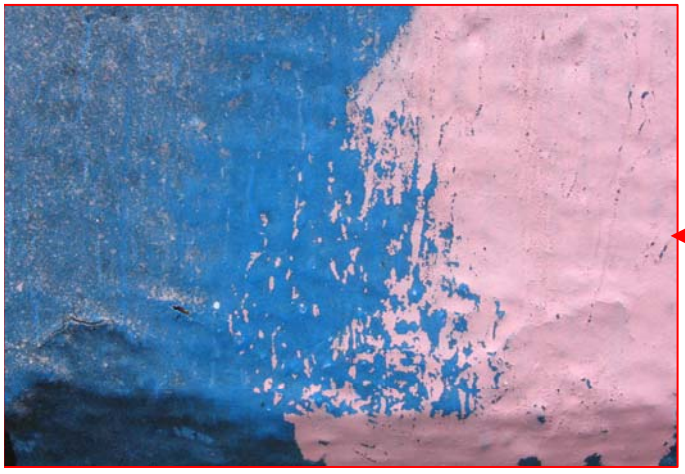


**Figure 10.21 (above):** *Site of trial 102-T.20; pre-cleaning.* **Photo: Courtauld Institute CWPD 2007**

**Figure 10.22:** *Detail; results of cleaning trial 102-T.20 showing removal of both the coating and less soluble graffiti paint with hot water.* **Photo: Courtauld Institute CWPD 2007**


**Figure 10.23:** *Sample locations for the evaluation of cleaning trial 102-T.19. (A) Pre-cleaning area, graffiti-covered sample area; (B) post-cleaning sample area.* **Photo: Courtauld Institute CWPD 2007**

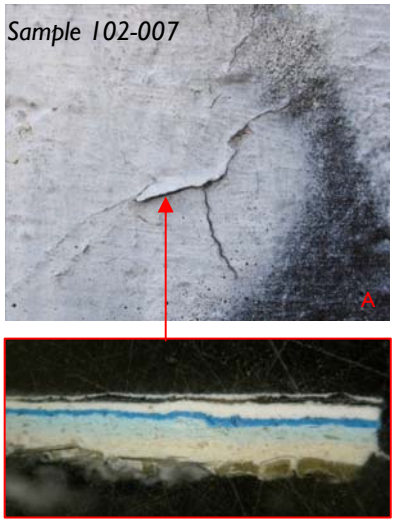



**Figure 10.24:** *CWPD x-section 3888, photographed at 100x.* **Photomicrograph: Courtauld Institute CWPD 2007**

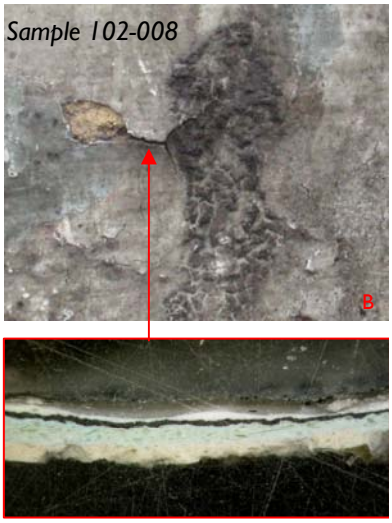
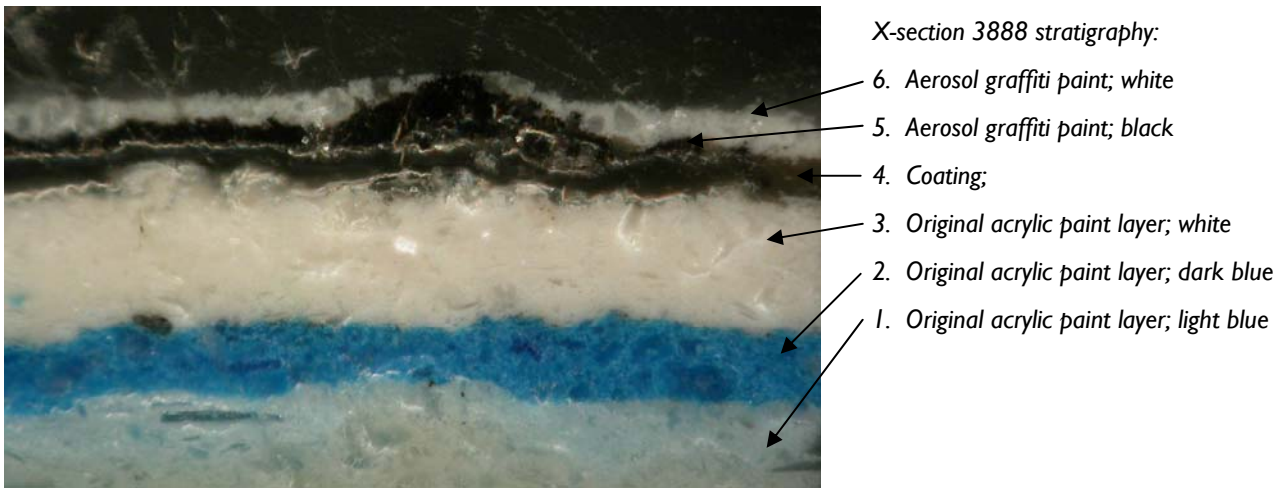


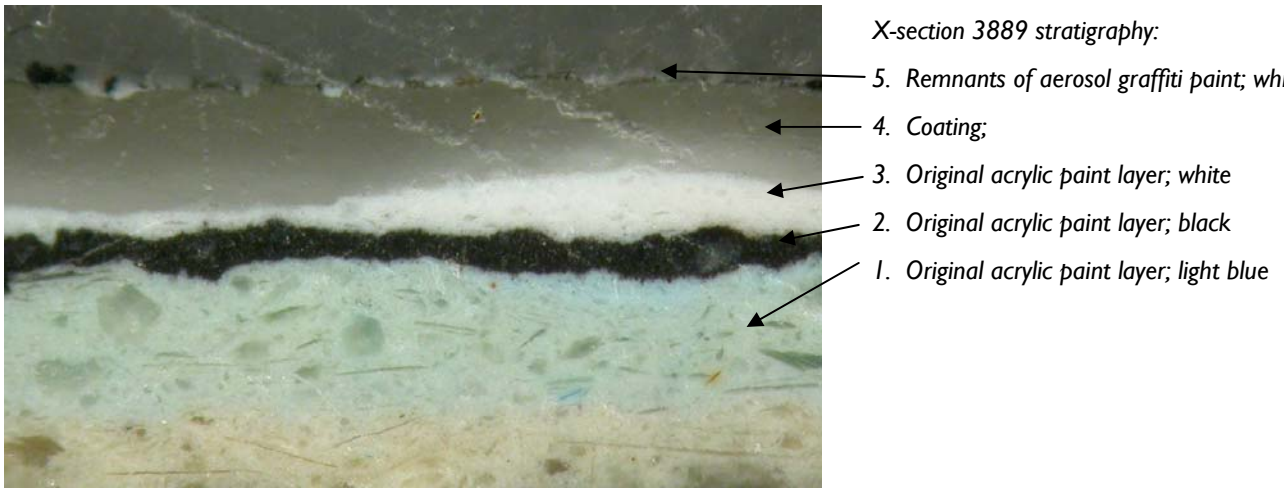

**Figure 10.25:** *CWPD x-section 3889, photographed at 100x.* **Photomicrograph: Courtauld Institute CWPD 2007**



*X-section 3888 stratigraphy:*

6. *Aerosol graffiti paint; white*
5. *Aerosol graffiti paint; black*
4. *Coating;*
3. *Original acrylic paint layer; white*
2. *Original acrylic paint layer; dark blue*
1. *Original acrylic paint layer; light blue*

**Figure 10.26:** *CWPD x-section 3888, photographed at 200x.* **Photomicrograph: Courtauld Institute CWPD 2007**



*X-section 3889 stratigraphy:*

5. *Remnants of aerosol graffiti paint; white & black*
4. *Coating;*
3. *Original acrylic paint layer; white*
2. *Original acrylic paint layer; black*
1. *Original acrylic paint layer; light blue*

**Figure 10.27:** *CWPD x-section 3889, photographed at 200x.* **Photomicrograph: Courtauld Institute CWPD 2007**

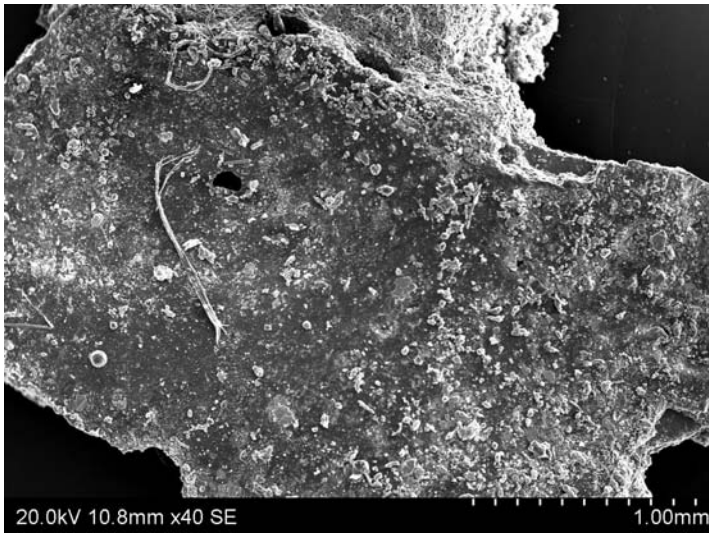



**Figure 10.28:** *Sample 102-006. Control sample – un-cleaned, no graffiti.* **SEM Photomicrograph: Courtauld Institute CWPD 2007**

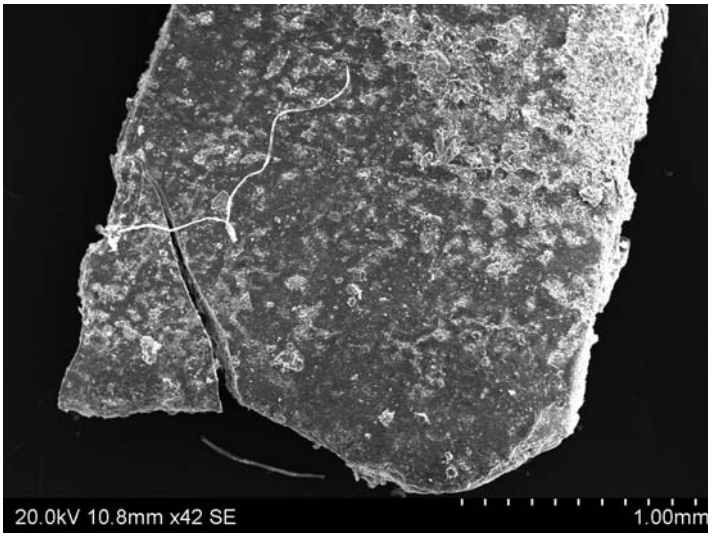
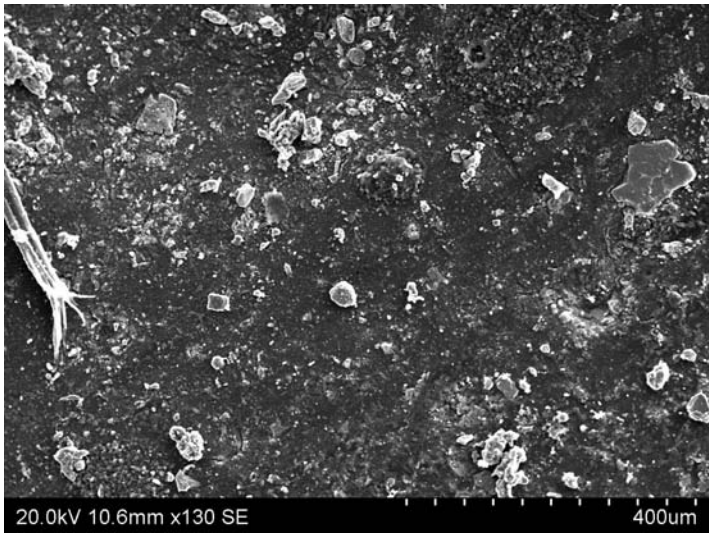
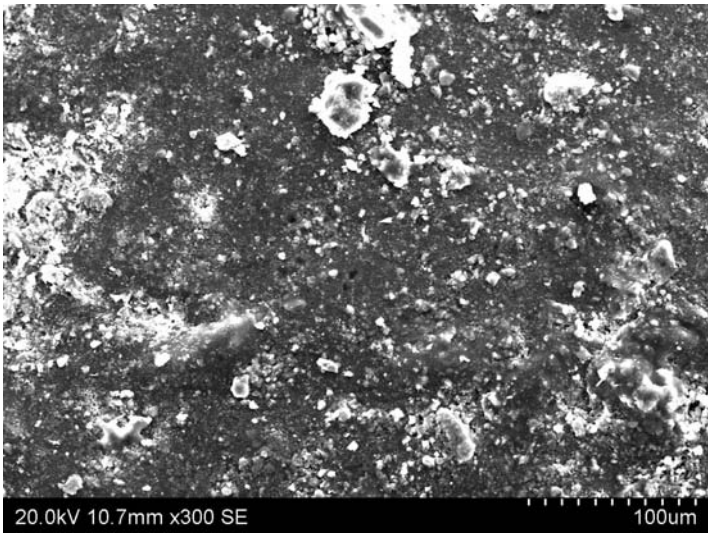
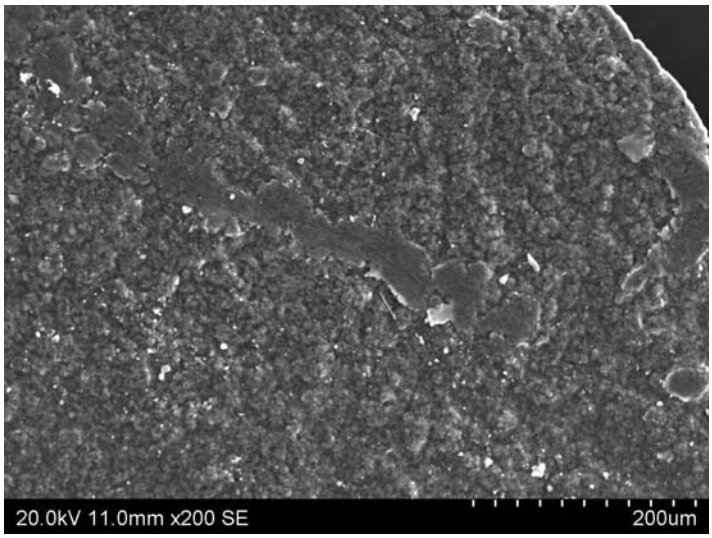


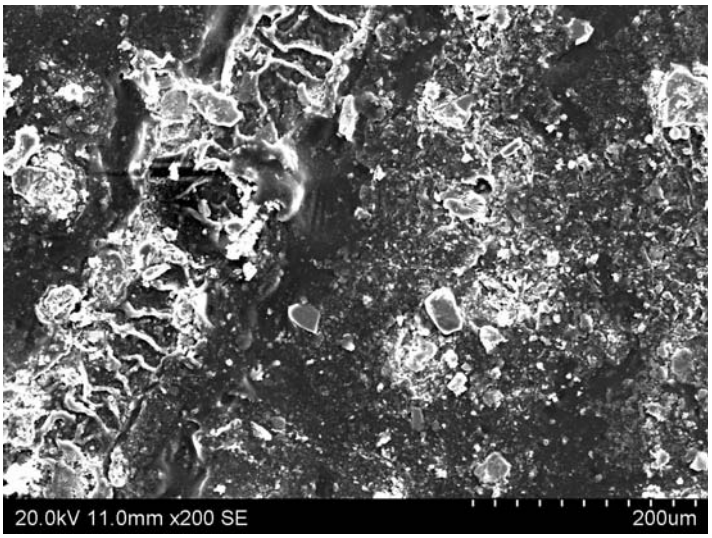

**Figure 10.29:** *Sample 102-008. The sample was taken from the site of cleaning trial 102-T.19 following the removal of graffiti paint.* **SEM Photomicrograph: Courtauld Institute CWPD 2007**




**Figures 10.30 (above left) and 10.31 (above right):** *The surfaces of the control sample102-006 (left) and the cleaned sample 102-008 (right) appear comparable even at high magnification. The surface of sample 102-008 does not appear to have been compromised by cleaning.* **SEM Photomicrograph: Courtauld Institute CWPD 2007**




**Figures 10.32 (above left) and 10.33 (above right):** *The photomicrographs depict thick accumulations of the added coating on both an un-cleaned graffiti-covered sample, 102-007 (left), and the cleaned sample, 102-008 (right). Cleaning appears to have noticeably impacted the surface of the mural only where the coating has accumulated in thick drips.* **SEM Photomicrograph: Courtauld Institute CWPD 2007**

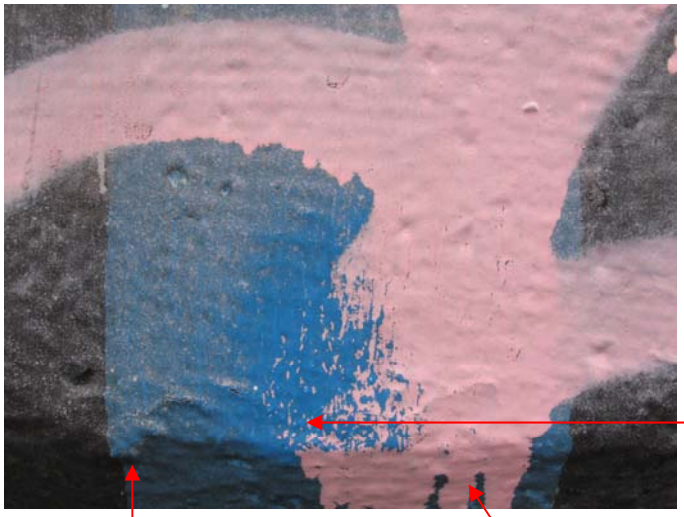


**Figure 10.34:** *Sample locations for the evaluation of cleaning trial 102-T.20. (A) Control sample – un-cleaned, no graffiti; (B) Pre-cleaning, graffiti-covered sample area; (C) post-cleaning sample area.* **Photo: Courtauld Institute CWPD 2007**


**Figure 10.35:** *CWPD x-section 3890, photographed at 100x.*
**Photomicrograph: Courtauld Institute CWPD 2007**

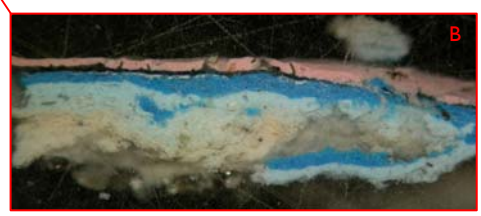



**Figure 10.36:** *CWPD x-section 3891, photographed at 100x.*
**Photomicrograph: Courtauld Institute CWPD 2007**

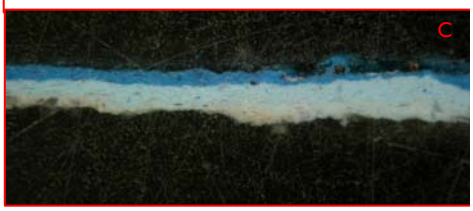



**Figure 10.38:** *CWPD x-section 3892, photographed at 100x.*
**Photomicrograph: Courtauld Institute CWPD 2007**

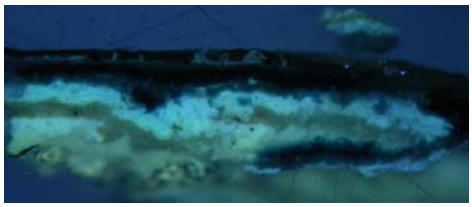


**Figure 10.37:** *CWPD x-section 3891, photographed at 100x. The coating is clearly visible under UV light although it does not necessarily fluoresce.*
**Photomicrograph: Courtauld Institute CWPD 2007**

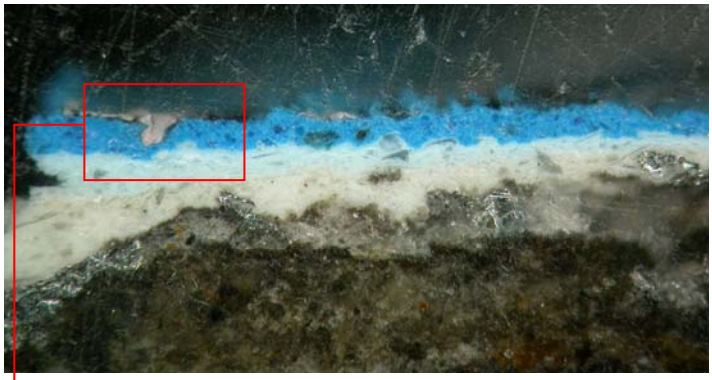


**Figure 10.39:** *CWPD x-section 3890, photographed at 200x.* Cross-section of painting prior to cleaning.
**Photomicrograph: Courtauld Institute CWPD 2007**

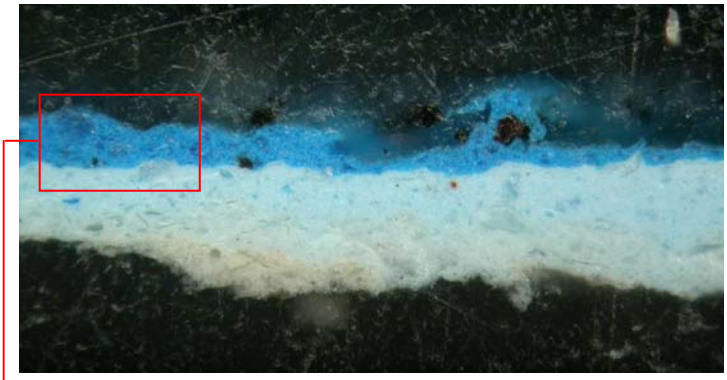


**Figure 10.40:** *CWPD x-section 3892, photographed at 200x.* Cross-section of painting post-cleaning.
**Photomicrograph: Courtauld Institute CWPD 2007**

**Figure 10.41:** The original paint layer is shown at high magnification (500x) with coating present.
**Photomicrograph: Courtauld Institute CWPD 2007**

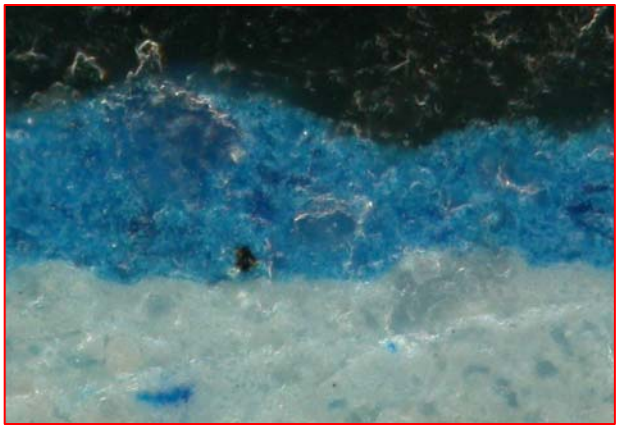


**Figure 10.42:** *At high magnification (500x) the original paint layer appears undamaged but the added coating is no longer visible.*
**Photomicrograph: Courtauld Institute CWPD 2007**

## *Case Study 2 (104) – Flow Inversion, Judith Von Euer*

*Refer to Figures 10.43 to 10.83*

### *In situ Assessment*

*In situ* observations suggested that the development of an adequate cleaning system was possible for the removal of graffiti from case study 104. The system involved a 5-minute application of a solvent mixture of MPA, Stoddard solvent, and NMP in Arbocel B800. The sorbent application swelled the graffiti layers sufficiently that they could then be removed by swabbing with a weaker solvent mixture (MPA and Stoddard solvent) since swabbing with the stronger mixture was found to damage the original paint (*see Appendix 4.3.6*) (*Figures 10.52 and 10.54*).

*Table 10.6 Summary of successful cleaning systems developed for the removal of graffiti from 'Flow Inversion' (104).*

| Cleaning System | | Pros. | Cons. |
|---|---|---|---|
| *Cleaning System 1 - Trial 104-T.21 (Figures 10.55 to 10.58 and 10.62 to 10.64)* | | | |
| *Application* | Arbocel B800 / MPA:Stoddard Solvent:NMP (7:7:1) (5 min.) | - Complete removal of graffiti<br>- No visible damage to the original paint layer<br>- Good results achieved on both smooth and stuccoed surfaces. | - More time consuming than is ideal<br>- Only applicable to more soluble graffiti materials<br>- Cleaning system can be seen to swell the original paint layer to a small degree. |
| *Clearance* | Swab / MPA:Stoddard Solvent (1:1) | | |

*Other results and observations (see Appendix 4.3.6):*

- Since the applied sorbents failed to absorb the swollen graffiti paint layers, swabbing was the only clearance method found which would remove the dirt but was also delicate enough that it would not damage the original materials. Absorbent tissues adhered to and lifted original paint layer while sponges introduced a damaging degree of mechanical action.
- No system could be developed for the successful removal of the less soluble graffiti material from the painting.
- The proprietary graffiti removal product tested, Graffiti Gold Remover ™ (*104-T.13*), was found to remove the more soluble graffiti almost completely in one small area, however the removal was rather inhomogeneous, uncontrollable, and damaging to both coating and original materials (*Figures 10.67 to 10.70*).

### *Analysis*

A sample from the cleaned area of trial *T.21* was compared with a control sample and a sample taken from a cleaned area visibly damaged during failed trial *T.19* (*Figures 10.59 to 10.61*).

*Cross-section microscopy (Figures 10.71 to 10.77):*

- The graffiti paint appeared to have been entirely removed in trial *T.21* while traces of graffiti are still visible on the surface of the failed cleaning trial sample.
- The coating appears to have been entirely removed during trial *T.21* while inconsistently removed during trial *T.19*.
- Visible damage to both samples is apparent in that the surfaces of both cross-sections appear rough and particulate in comparison to the control sample. The surface of trial *T.19* sample appeared particularly rough and pockmarked.

- The sample from cleaning trial *T.20* is heavily fractured, indicating that cleaning severely weakened the original paint layer at least temporarily (sample was taken quite quickly following treatment).

*Scanning electron microscopy (Figures 10.78 to 10.83):*

- The surfaces of cleaning trial samples appear somewhat damaged in comparison to the control sample. Their surfaces are visibly rougher and contain more particulate matter.
- The surface of trial *T.19* is even rougher than that of trial *T.20* and contains tiny perforations where the integrity of the surface has been compromised through cleaning.

**Figure 10.43:** *'Flow Inversion' by Judith Von Euer, 1974, 110 Freeway retaining wall at 1st St. in Downtown Los Angeles, California. The mural is shown here as it originally appeared.* **Photo: E. Long 1975.**

**Figure 10.44:** *Overall view of 'Flow Inversion' in its current condition. Presently extensive graffiti paint covers the lower region of the mural.* **Photo: Courtauld Institute CWPD 2007**

**Figure 10.45:** *The stretch of wall adjacent to the mural painting remains un-graffitied since maintenance crews are fast to paint out any graffiti found on the blank cement wall but cannot paint over graffiti found on the mural surface.* **Photo: Courtauld Institute CWPD 2007**

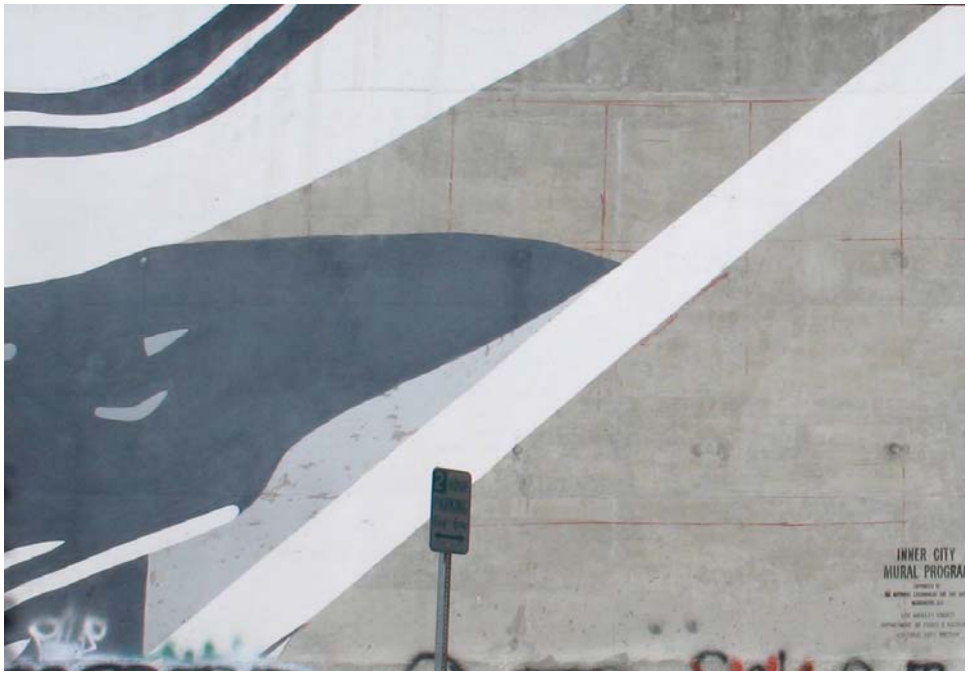



**Figure 10.46:** *Red painted grid lines which assisted the artist in drawing the outline of the mural on a large scale are still clearly visible today.* **Photo: Courtauld Institute CWPD 2007**

**Figure 10.48:** *Detail of Figure 10.47* **Photo: Courtauld Institute CWPD 2007**

**Figure 10.47:** *The lower third of the mural's support is covered with a highly textured, cement-based surface know as 'stucco'. The heavy texture can make it difficult to achieve a homogeneous result during cleaning.* **Photo: Courtauld Institute CWPD 2007**

**Figures 10.49 (above left) and 10.50 (above right):** *Although the mural displays some evidence of peeling, cracking, and blistering, the paint layer appears to be in good condition in most areas. The above figures depict an area of the original paint layer in poor condition under normal (left) and raking light (right).* **Photo: Courtauld Institute CWPD 2007**

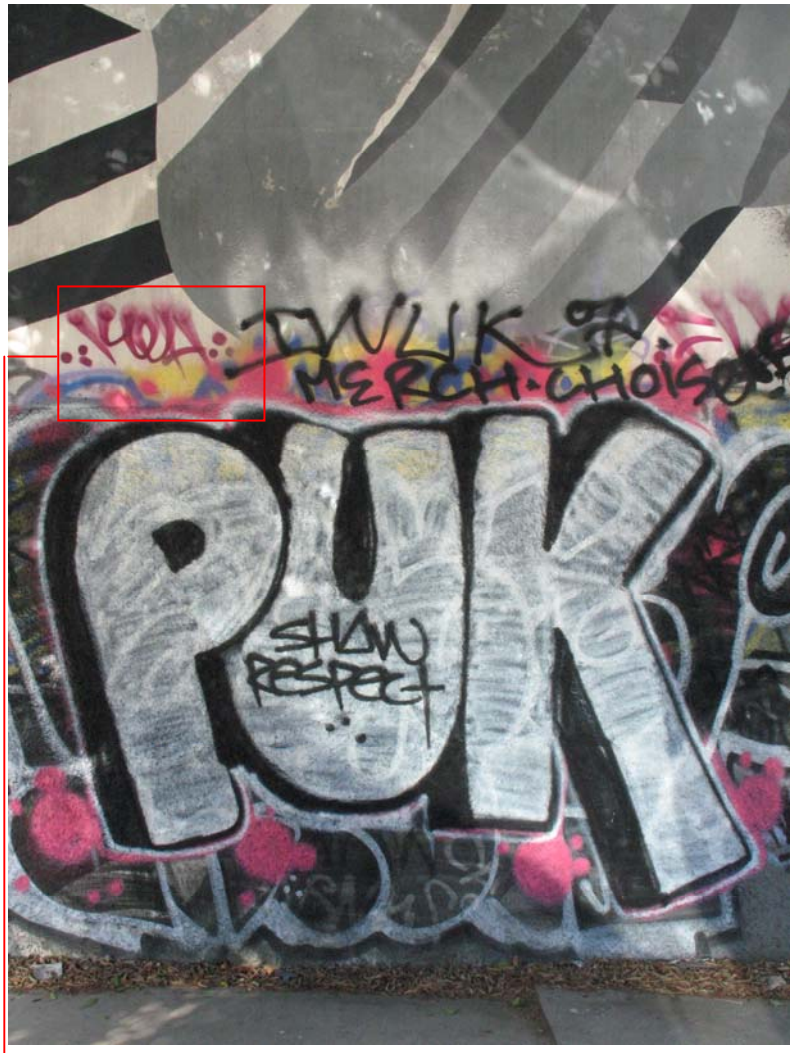



**Figure 10.51:** *The image shows the area in which final cleaning trials were carried out. The mural surface is here depicted prior to cleaning.* **Photo: Courtauld Institute CWPD 2007**

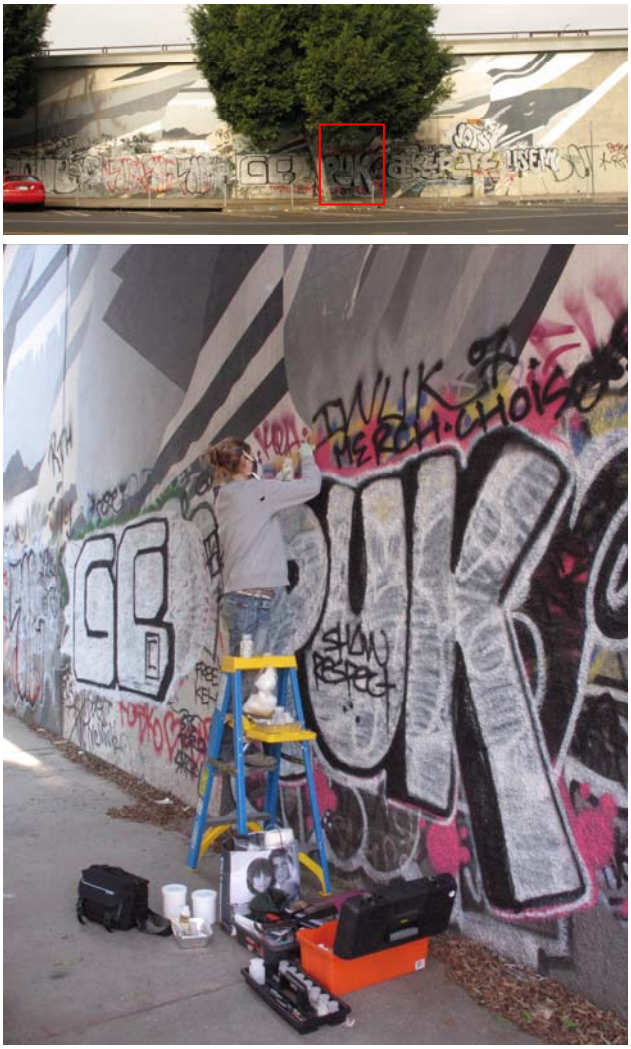



**Figure 10.52:** *Cleaning trials being carried out.* **Photo: Courtauld Institute CWPD 2007**


**Figure 10.53:** *Results of final cleaning trial, (A) 104-T.21 and failed trial (B) 104-T.19.* **Photo: Courtauld Institute CWPD 2007**

**Figure 10.54:** *The final cleaning trial (104-T.21) was carried out with the application of a solvent mixture in Arbocel B800. The Arbocel was applied to the mural surface and could be removed section by section. In this way it was possible to avoid evaporation of the solvent from the graffiti paint before the added materials were adequately removed by swabbing with free solvent.* **Photo: Courtauld Institute CWPD 2007**

**Figure 10.55 (right):** *Sites of cleaning trials (B) 104-T.19 and (A) 104-T.21. Details of trial areas are pictured below.* **Photo: Courtauld Institute CWPD 2007**



**Figure 10.56 (left):** *Results of successful cleaning trial, 104-T.21.* **Photo: Courtauld Institute CWPD 2007**

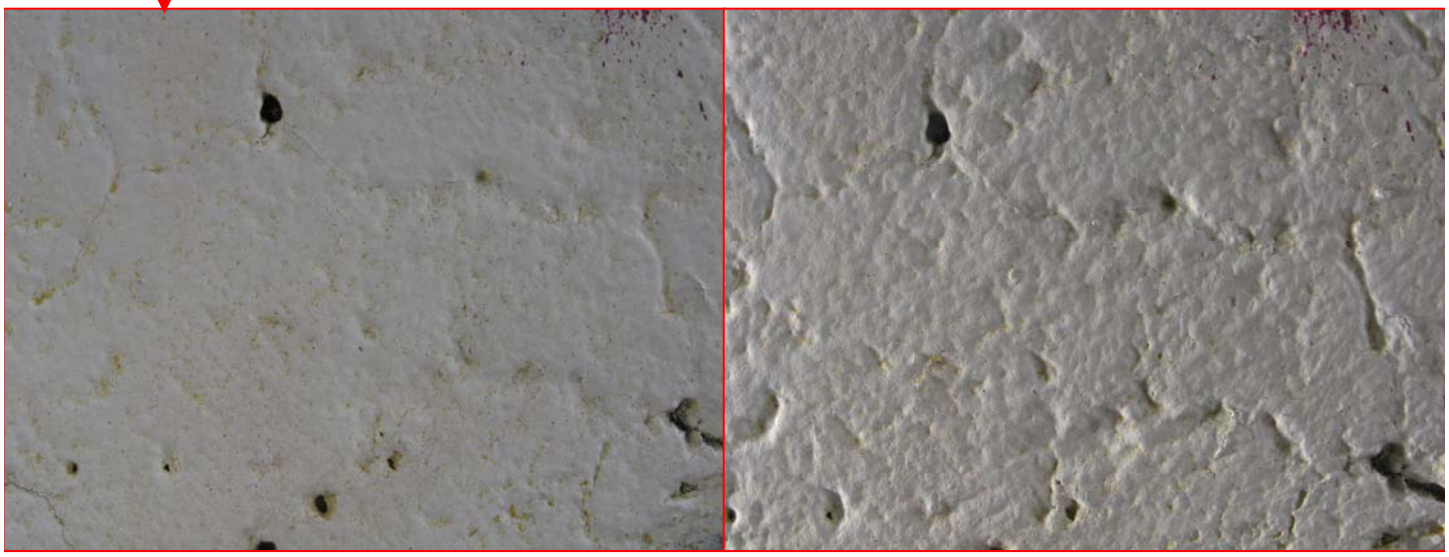
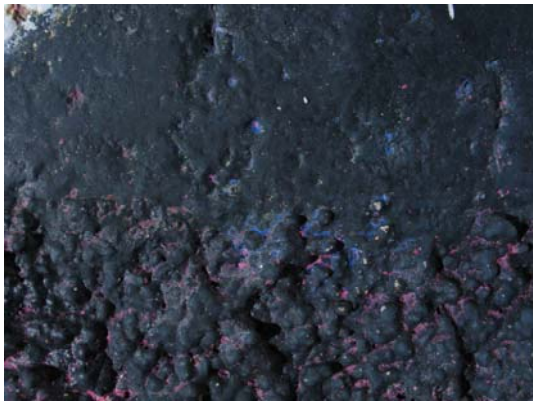


**Figure 10.57 (above left) and 10.58 (above right):** *Detail of the mural surface following cleaning trial 104-T.21. A small amount of aerosol graffiti paint can be seen to remain in crevices on the mural's surface however, the original paint layer appears intact and un-damaged. Results are drastically better than those achieved in cleaning trial 104-T.19, the results of which are shown below.* **Photo: Courtauld Institute CWPD 2007**


**Figure 10.59 (right):** *Results of failed cleaning trial, 104-T.19.* **Photo: Courtauld Institute CWPD 2007**

**Figures 10.60 (above left) and 10.61 (above right):** *Detail of the mural surface following cleaning trial 104-T.19. The vast majority of graffiti paint has been removed, but the original paint layer has been visibly and severely damaged in the process.* **Photo: Courtauld Institute CWPD 2007**

**Figure 10.62:** *Results of cleaning trial 104-T.21, showing successful removal of the graffiti paint from the mural's stucco surface.* **Photo: Courtauld Institute CWPD 2007**



**Figures 10.63 and 10.64 (right):** *Details of cleaning trial 104-T.21 over stucco surface in normal (top) and raking light (bottom). Slightly more graffiti paint can be seen to remain on the surface of the mural in this area but the overall results are excellent and cleaning has had no visible impact on the original paint layer.* **Photo: Courtauld Institute CWPD 2007**

**Figure 10.65 (left):** *Patches of the less-soluble aerosol graffiti materials were encountered beneath the more-soluble paint as cleaning was undertaken in trial 104-T.21. Unfortunately, the cleaning system implemented was unable to successfully remove this material.* **Photo: Courtauld Institute CWPD 2007**

**Figure 10.66 (left):** *Detail of Fig. 10.64.* **Photo: Courtauld Institute CWPD 2007**

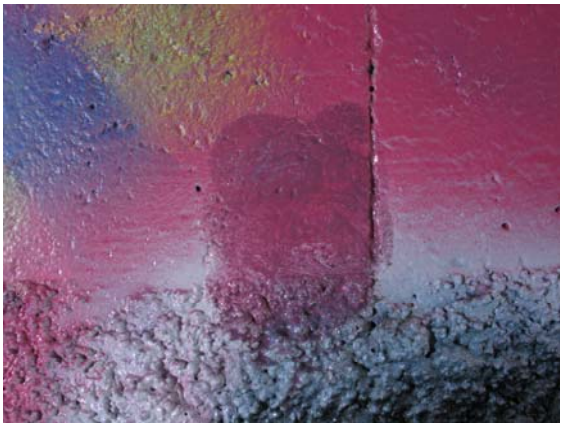
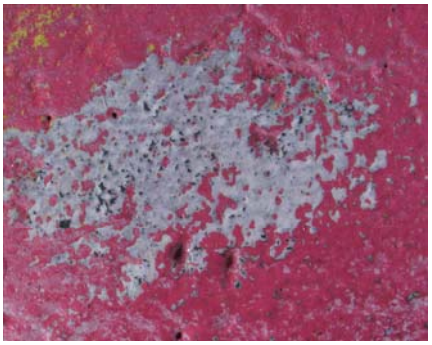


**Figure 10.67 (above right):** *During trial 104-T.13 in which the proprietary graffiti-removal product, Graffiti Gold Remover ™, was used for cleaning.* **Photo: Courtauld Institute CWPD 2007**

**Figure 10.68 (above):** *Results of cleaning trial 104-T.13. The results are extremely poor in comparison to the results achieved with the developed system in cleaning trial 104-T.21.* **Photo: Courtauld Institute CWPD 2007**



**Figures 10.69 (above left) and 10.70 (above right):** *Details of cleaning trial 104-T.13 in normal (left) and raking light (right). Removal of the graffiti paint is limited and results are inhomogeneous. Furthermore, the original paint layer has been visibly damaged and worn away in areas.* **Photo: Courtauld Institute CWPD 2007**


**Figure 10.72:** *CWPD x-section 3893, photographed at 100x.* **Photomicrograph: Courtauld Institute CWPD 2007**

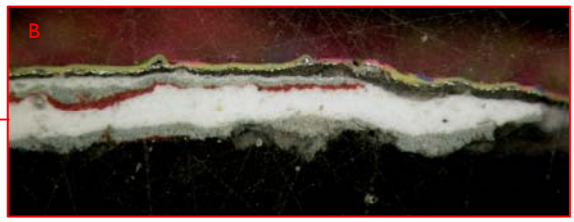


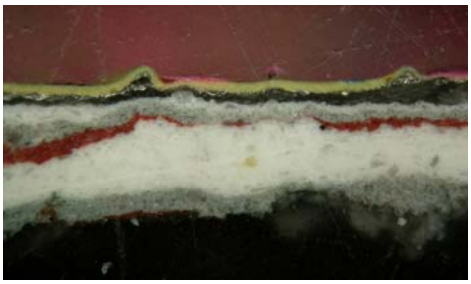

**Figure 10.73:** *CWPD x-section 3894, photographed at 100x.* **Photomicrograph: Courtauld Institute CWPD 2007**

**Figure 10.71:** *Sample locations for the evaluation of cleaning trial 104-T.21. (A) Control sample – un-cleaned, no graffiti; (B) Pre-cleaning, graffiti-covered area; (C) post-cleaning area; (D) Comparative sample – area damaged during trial 104-T.19.* **Photo: Courtauld Institute CWPD 2007**


**Figure 10.74:** *CWPD x-section 3895, photographed at 100x.* **Photomicrograph: Courtauld Institute CWPD 2007**

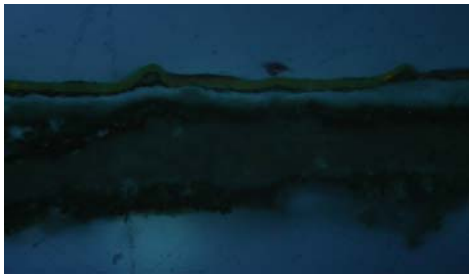

**Figure 10.75:** *CWPD x-section 4082, photographed at 100x.* **Photomicrograph: Courtauld Institute CWPD 2007**

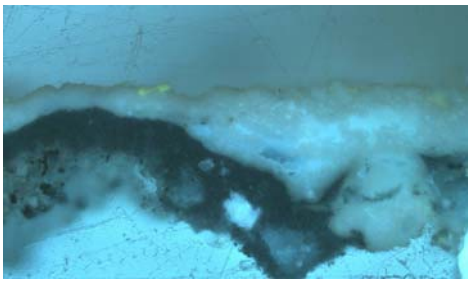
*X-section 3893, 200x; under normal (top) and UV (bottom) lights.*



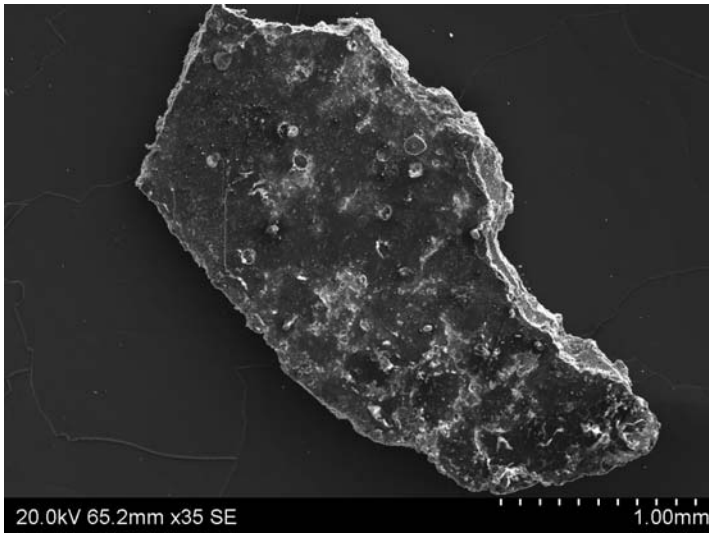
*X-section 3894, 200x; under normal (top) and UV (bottom) lights.*

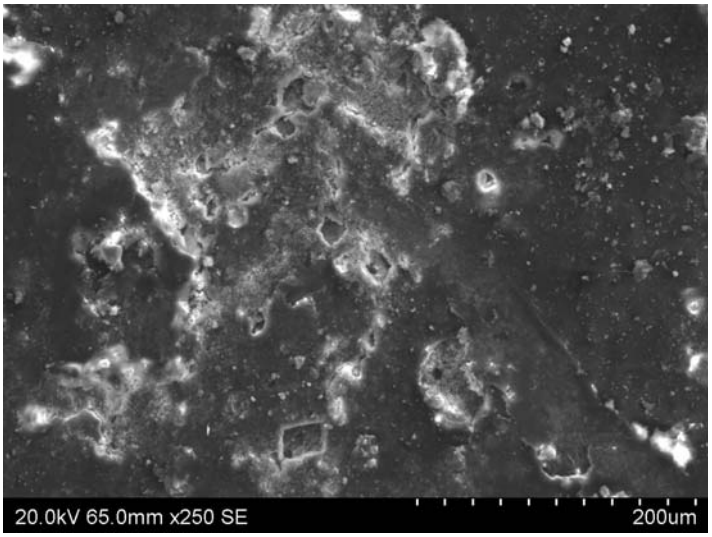
*X-section 4082, 200x; under normal (top) and UV (bottom) lights.*



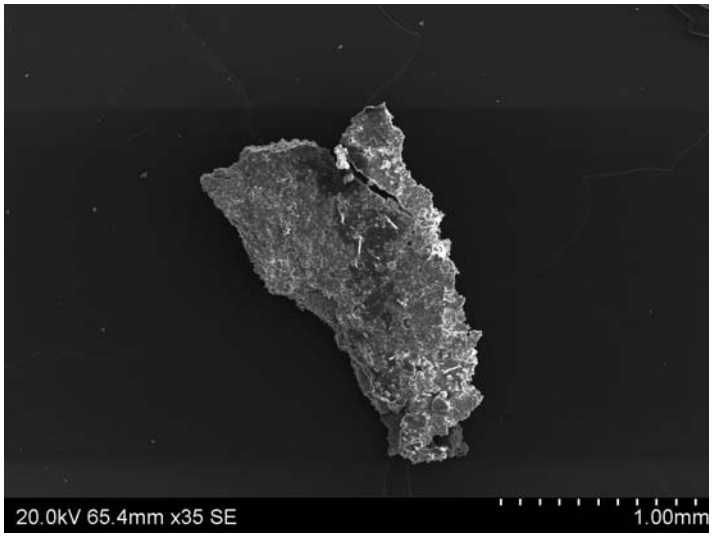


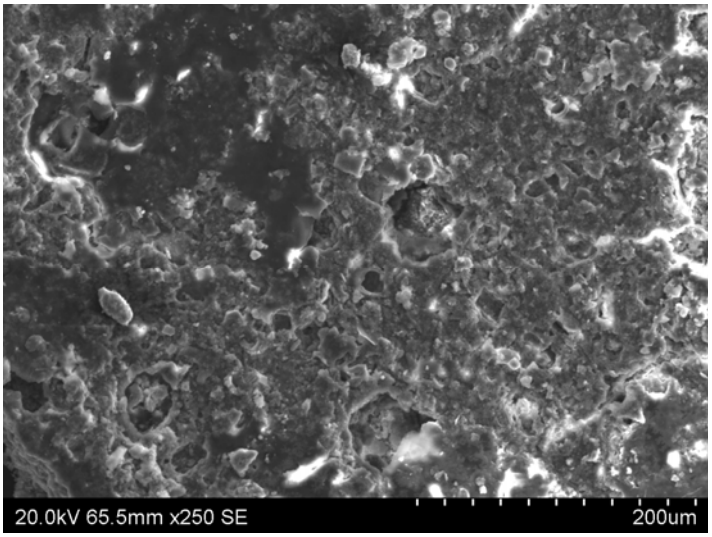
**Figures 10.76 (above left) and 10.77 (above right):** *X-section 3895, 200x; under normal (left) and UV (right) lights. The surface of the cleaned paint layer appears rougher than the control sample and no evidence of the coating remains after cleaning. Although the sample is heavily fractured, this is likely due to sampling procedure rather than specifically to damage caused during cleaning.* **Photomicrograph: Courtauld Institute CWPD 2007**



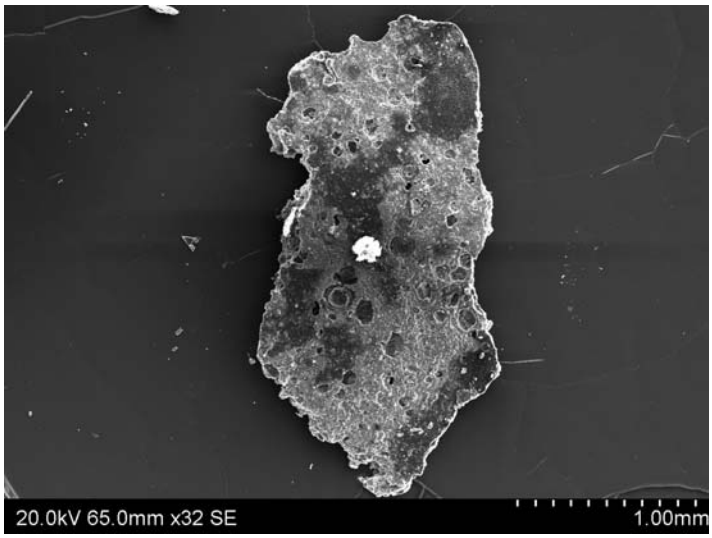



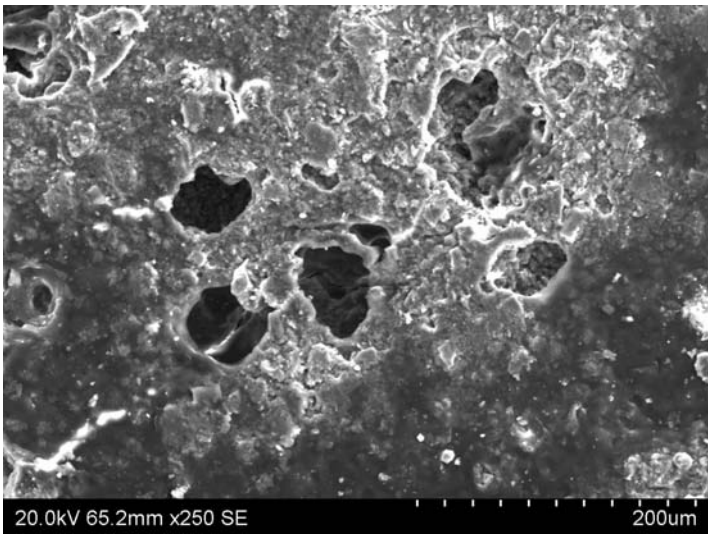

**Figures 10.78 (above left) and 10.79 (above right):** *Sample 104-010. Control sample – un-cleaned, no graffiti.* **SEM Photomicrograph: Courtauld Institute CWPD 2007**




**Figures 10.80 (above left) and 10.81 (above right):** *Sample 104-012. The sample was taken from the site of cleaning trial 104-T.21 following the removal of graffiti paint.* **SEM Photomicrograph: Courtauld Institute CWPD 2007**




**Figures 10.82 (above left) and 10.83 (above right):** *Sample 104-013. The sample was taken from the site damaged by cleaning trial 104-T.19 for comparative purposes with sample 104-012.* **SEM Photomicrograph: Courtauld Institute CWPD 2007**

## *Case Study 3 (105) – Untitled (Elysian Park), Janet Sellers and James Garcia*

*Refer to Figures 10.84 to 10.121*

### *In situ Assessment*

The same system observed to be successfully implemented on case study 104, *Flow Inversion*, was shown through *in situ* observations to have success on case study 105 (*see Appendix 4.4.6*).

*Table 10.7 Summary of successful cleaning systems developed for the removal of graffiti from the Elysian Park mural (105).*

| Cleaning System | | Pros. | Cons. |
|---|---|---|---|
| *Cleaning System 1 - Trial 104-T.12 (Figures 10.94 to 10.99)* | | | |
| *Application* | Carbogel 3% MPA:Stoddard Solvent:NMP (7:7:1) (5 min.) | - Complete removal of graffiti with only slight ghosting in a few areas<br>- Very little damage to the original paint layer observed overall, although some original pigments proved weaker than others<br>- Excellent results particularly since mural was un-coated | - Time consuming<br>- Only applicable to more soluble graffiti materials<br>- Cleaning system mobilized original paint layer where layer was particularly weak. |
| *Clearance* | Swabbing with MPA:Stoddard Solvent (1:1) | | |

*Other results and observations (see Appendix 4.4.6):*

- Since the applied sorbents failed to absorb the swollen graffiti paint layers, swabbing was the only clearance method found which would remove the dirt but was delicate enough that it wouldn't damage the original materials. Absorbent tissues adhered to and lifted original paint layer while sponges introduced a damaging degree of mechanical action.
- No system could be developed for the successful removal of the less soluble graffiti material from the painting.
- The proprietary graffiti removal product tested, Mötsenböcker's Lift Off 4 ® (*105-T.13*), was rather ineffective on the graffiti material, but severely damaging to the original paint layer (*Figures 10.100 to 10.103*).

### *Analysis*

A sample from an undamaged area of cleaning trial *104-T.12* was evaluated against a control sample and a visibly damaged area from the same trial.

*Cross-section microscopy:*

- A slight discoloration (lightening) of the uppermost paint layer of the successfully cleaned area was observed in comparison to the control sample. Apart from this, no visible damage was observed (*Figures 10.104 to 10.109*).
- The uppermost, dark paint layer is no longer visible in the cross-section taken from the area damaged by cleaning. Apart from this, no visible damage was observed (*Figure 10.110*).

- Thinning of the original paint layer and residual graffiti material was observed on the sample taken from an area cleaned with the proprietary graffiti removal product (*Figures 10.111 to 10.115*)

*Scanning electron microscopy (Figures 10.116 to 10.121):*

- Samples show some alteration in the surface topography as a result of cleaning. Craters likely caused by air bubbles during drying, have been visibly widened and eroded by cleaning. Damage appears minimal on the sample taken from the successfully cleaned area of painting, but the impact is noticeably greater on the sample from a less-successfully cleaned area.

**Figure 10.84:** *Untitled mural by Janet Sellers, James Garcia, and local youth; 1985, in Elysian Park located on either side of the Academy Road park entrance, Los Angeles, California. View of north wall.* **Photo: Courtauld Institute CWPD 2007**

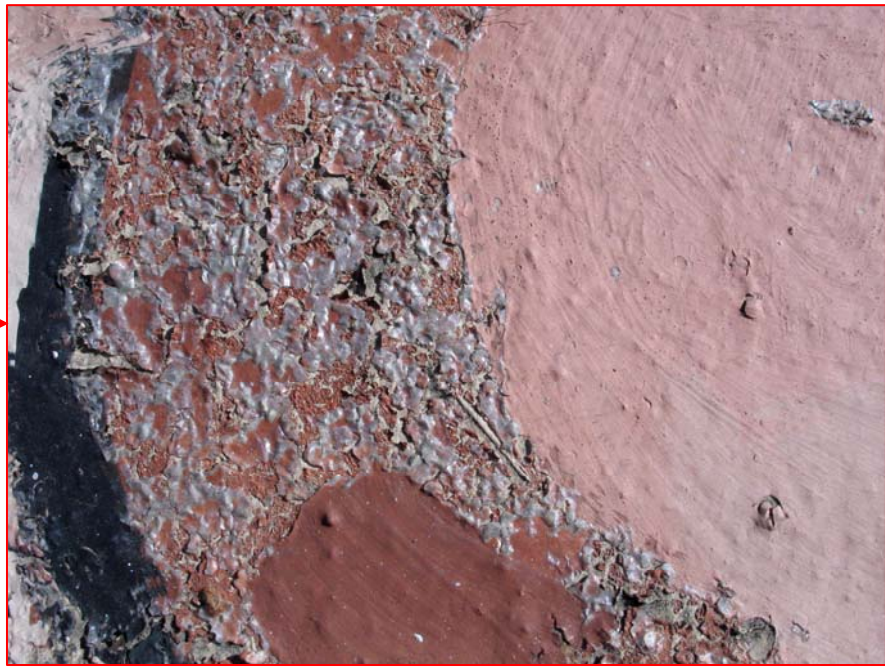
**Figure 10.85:** *Elysian Park mural. View of south wall and reverse side of north wall.* **Photo: Courtauld Institute CWPD 2007**

**Figure 10.86 (above):** *Detail; south wall.* **Photo: Courtauld Institute CWPD 2007**

**Figure 10.87 (above):** *Detail; north wall.* **Photo: Courtauld Institute CWPD 2007**

**Figure 10.88 (above right):** *The mural is located on two retaining walls composed of Portland cement containing large aggregate.* **Photo: Courtauld Institute CWPD 2007**

**Figures 10.89 – 10.93:** *Although the mural displays areas of original paint layer in extremely poor condition, stable locations were easily identified for the implementation of cleaning trials.* **Photo: Courtauld Institute CWPD 2007**



**Figures 10.89 (above left) and 10.90 (above right):** *Detail; north wall. Cracking and flaking of the original paint layer.* **Photo: Courtauld Institute CWPD 2007**

**Figures 10.91 (above left) and 10.92 (above right):** *Detail; north wall. Severe curling of the original paint and preparatory layers.* **Photo: Courtauld Institute CWPD 2007**

**Figure 10.93 (right):** *Detail; north wall. Large area of loss.* **Photo: Courtauld Institute CWPD 2007**

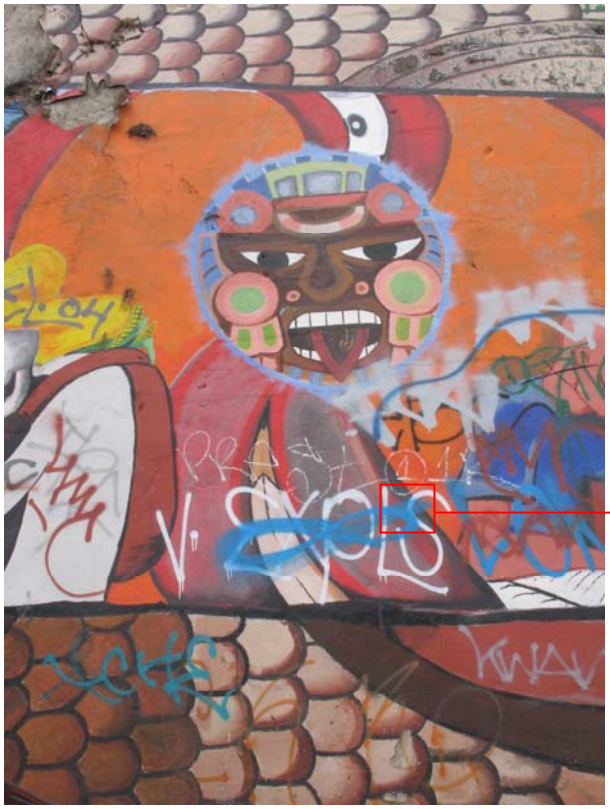


**Figure 10.94 (left):** *Site of successful cleaning trial, 105-T.12.* **Photo: Courtauld Institute CWPD 2007**

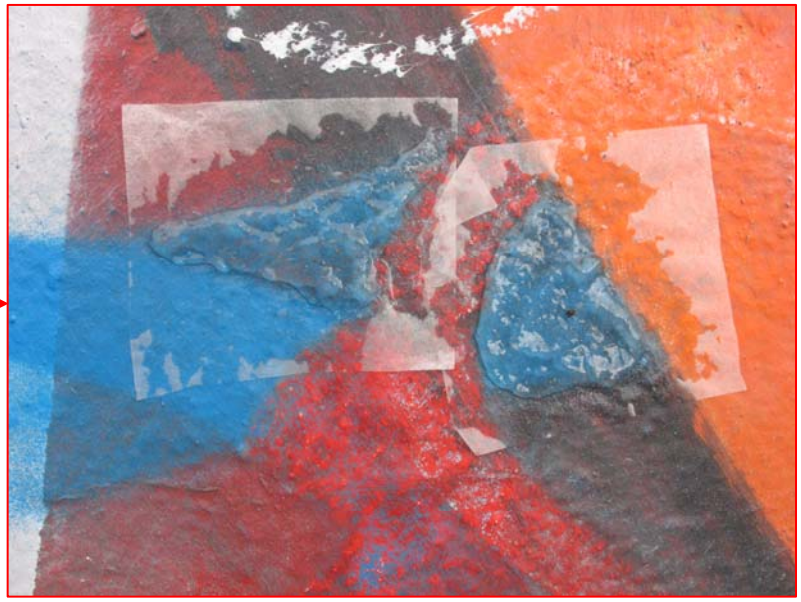
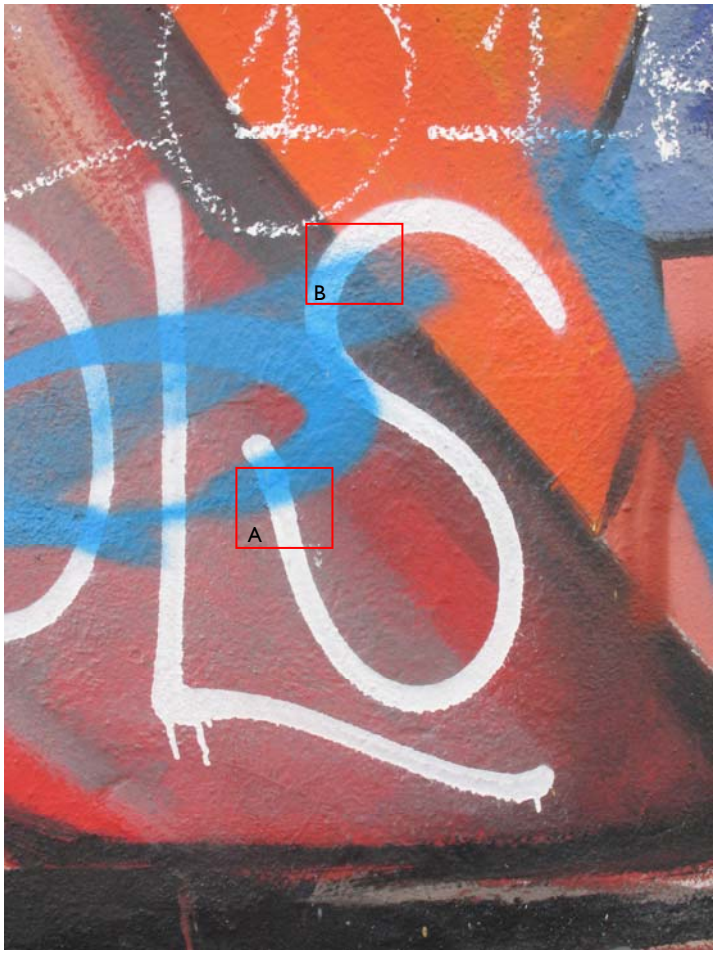
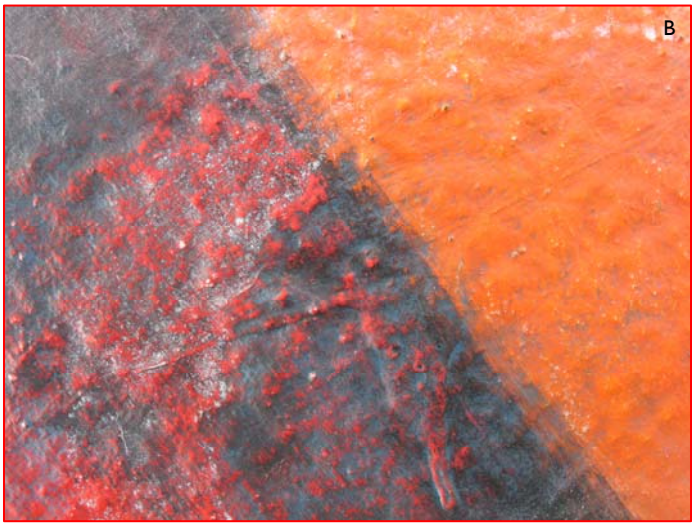


**Figure 10.95 (above right):** *Cleaning trial 105-T.12 was carried out with the application of a solvent mixture in Carbogel 3%. The system was applied to the mural surface in small sections which were easily conformed to the thin strips of aerosol paint encountered. The small sections also helped to control evaporation of the solvent from the graffiti paint during clearance so the added materials could be adequately removed by swabbing with free solvent before re-coalescence of the graffiti paint film occurred.* **Photo: Courtauld Institute CWPD 2007**




**Figures 10.96 (above left) and 10.97 (above right):** *Site of final cleaning trial,105-T.12, before (left) and after (right) graffiti removal.* **Photo: Courtauld Institute CWPD 2007**


**Figures 10.98 (above left) and 10.99 (above right):** *Details of trial site post-cleaning. Some areas of original paint layer were unaffected by cleaning (left) while in weaker areas, a small amount of ghosting remains and some original pigment was removed (right).* **Photo: Courtauld Institute CWPD 2007**

**Figure 10.101 (above):** *Site of cleaning trial105-T.13, post-cleaning.* **Photo: Courtauld Institute CWPD 2007**

**Figure 10.100 (above):** *Site of cleaning trial105-T.13. The proprietary product, Mötsenböcker's Lift Off 4 ®, was tested for the removal of graffiti paint.* **Photo: Courtauld Institute CWPD 2007**

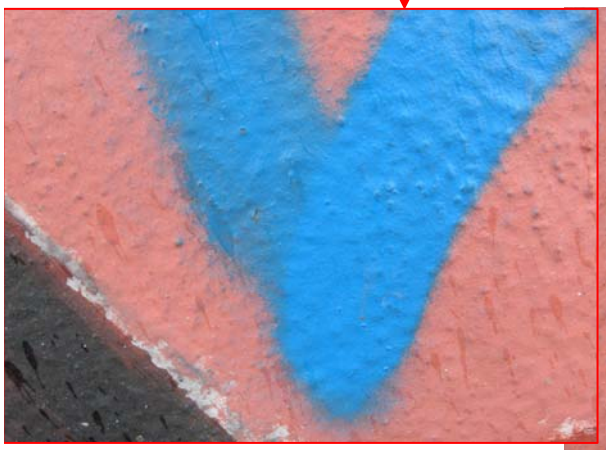


**Figure 10.102 (above):** *Site of cleaning trial105-T.13, pre-cleaning.* **Photo: Courtauld Institute CWPD 2007**

**Figure 10.103 (above right):** *Site of cleaning trial105-T.13, post-cleaning. The proprietary graffiti removal product was unable to successfully remove all aerosol paint and visibly damaged the mural by causing mobilization and cracking of the original paint layer.* **Photo: Courtauld Institute CWPD 2007**


**Figure 10.105:** *CWPD x-section 4083, photographed at 100x.* **Photomicrograph: Courtauld Institute CWPD 2007**


**Figure 10.106:** *CWPD x-section 4085, photographed at 100x.* **Photomicrograph: Courtauld Institute CWPD 2007**


**Figure 10.107:** *CWPD x-section 4086, photographed at 100x.* **Photomicrograph: Courtauld Institute CWPD 2007**

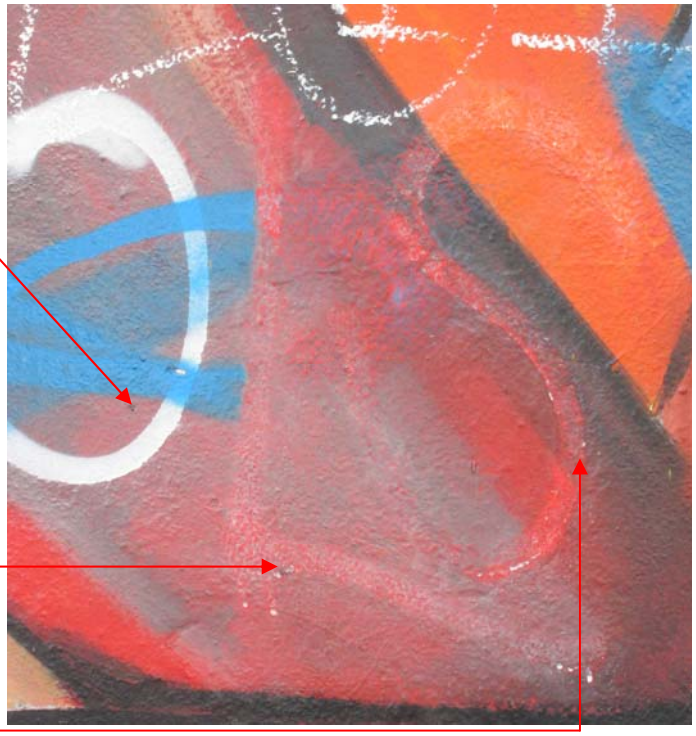


**Figure 10.104:** *Sample locations for the evaluation of cleaning trial 105-T.12. (A) Control sample – un-cleaned, no graffiti; (B) Successfully cleaned area; (C) Comparative sample – area visibly damaged by cleaning.* **Photo: Courtauld Institute CWPD 2007**

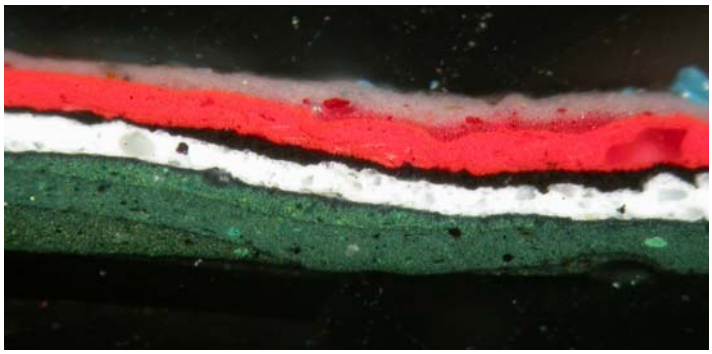


**Figure 10.108:** *X-section 4083, photographed at 200x. The control sample has a thin grey surface paint layer which should be present in the cleaned sample if the original paint layer was indeed undamaged by cleaning.* **Photomicrograph: Courtauld Institute CWPD 2007**

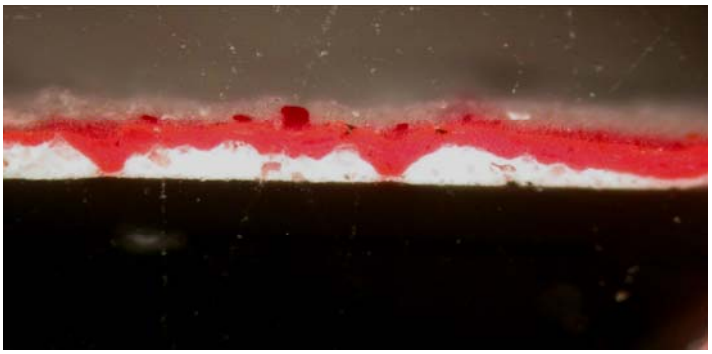


**Figure 10.109:** *X-section 4085, photographed at 200x. The cleaned sample can be seen to retain its original grey surface layer, although it appears slightly lightened in colour.* **Photomicrograph: Courtauld Institute CWPD 2007**

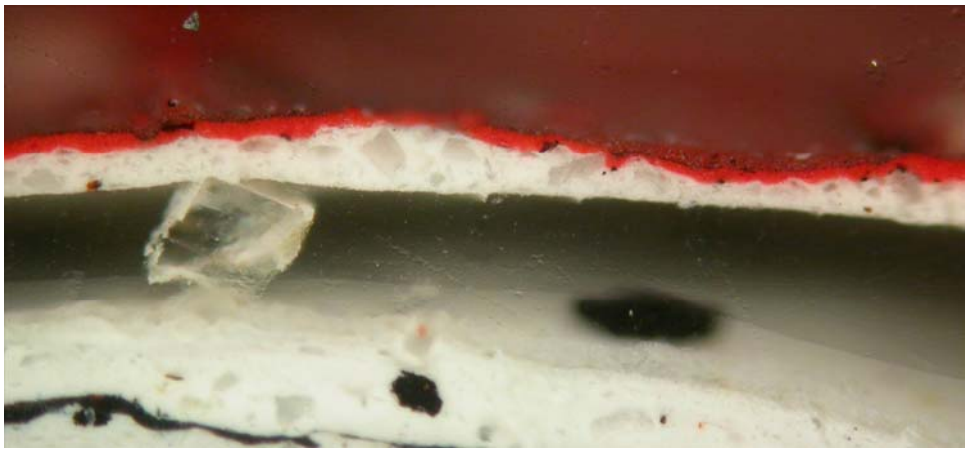


**Figure 10.110:** *X-section 4086, photographed at 200x. Based on its location, the cleaned sample should have a thin black paint layer across its surface. Mobilization of this layer was observed during cleaning however and only slight traces of the layer are visible in the cross-section taken from this area.* **Photomicrograph: Courtauld Institute CWPD 2007**

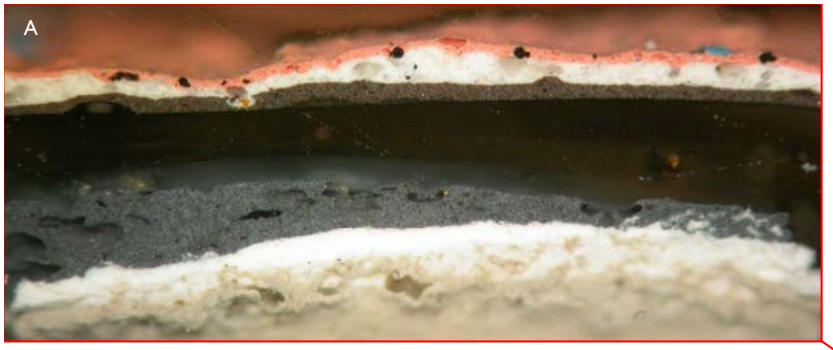



**Figure 10.112:** *CWPD x-section 4087, photographed at 100x.* **Photomicrograph: Courtauld Institute CWPD 2007**

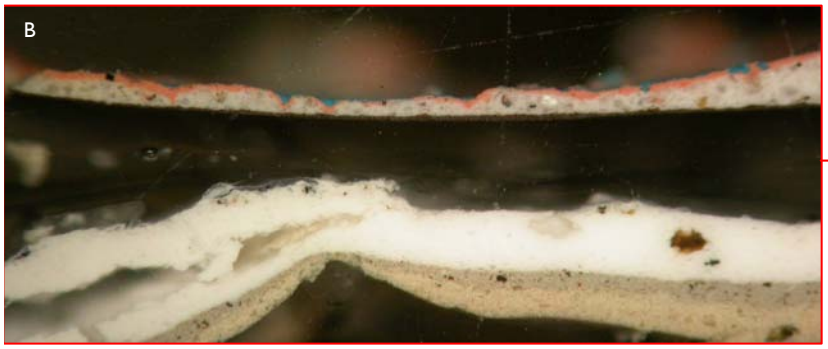



**Figure 10.113:** *CWPD x-section 4088, photographed at 100x.* **Photomicrograph: Courtauld Institute CWPD 2007**

**Figure 10.111:** *Sample locations for the evaluation of cleaning trial 105-T.13. (A) Control sample – un-cleaned, no graffiti; (B) Area damaged by cleaning with proprietary graffiti removal product, Mötsenböcker's Lift Off 4 ®.* **Photo: Courtauld Institute CWPD 2007**

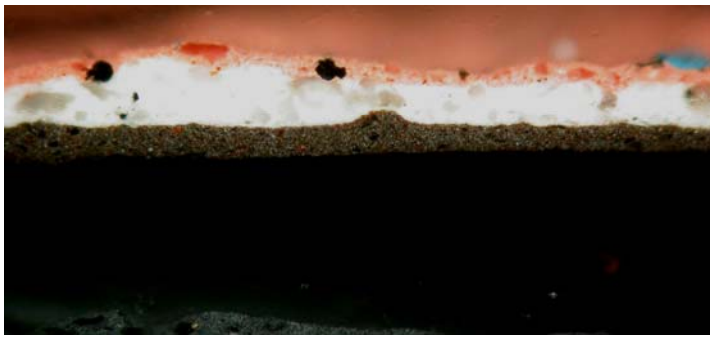


**Figure 10.114:** *CWPD x-section 4087, photographed at 200x.* **Photomicrograph: Courtauld Institute CWPD 2007**

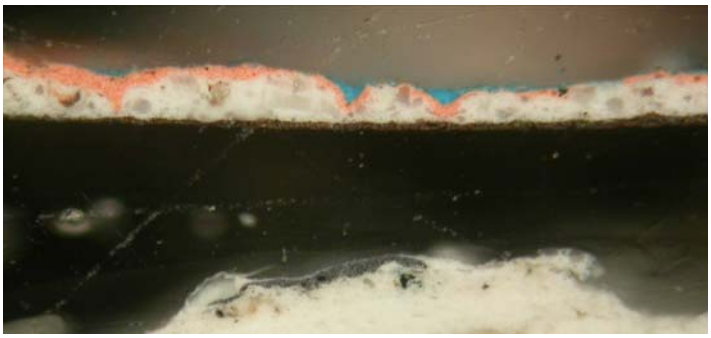
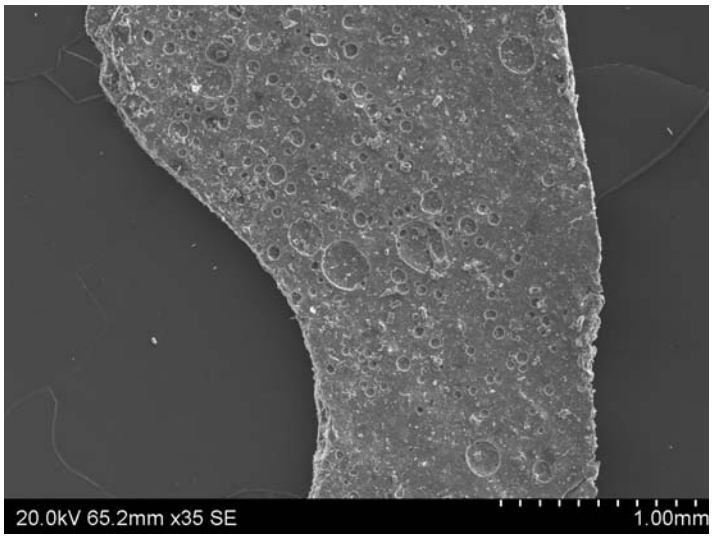
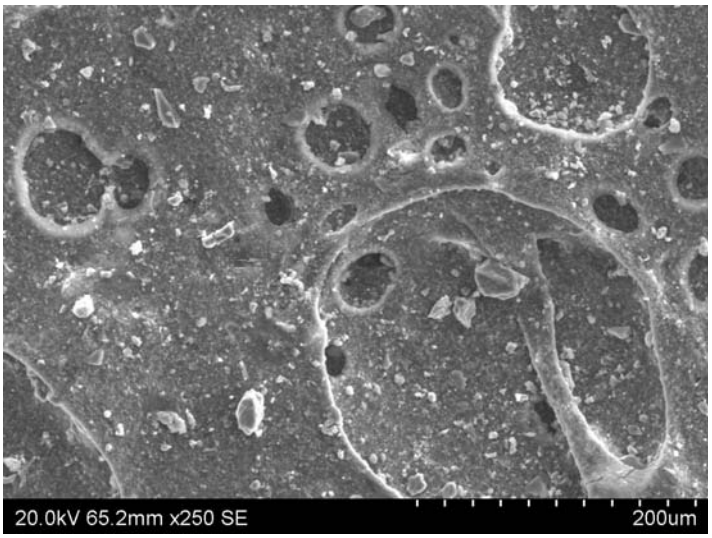
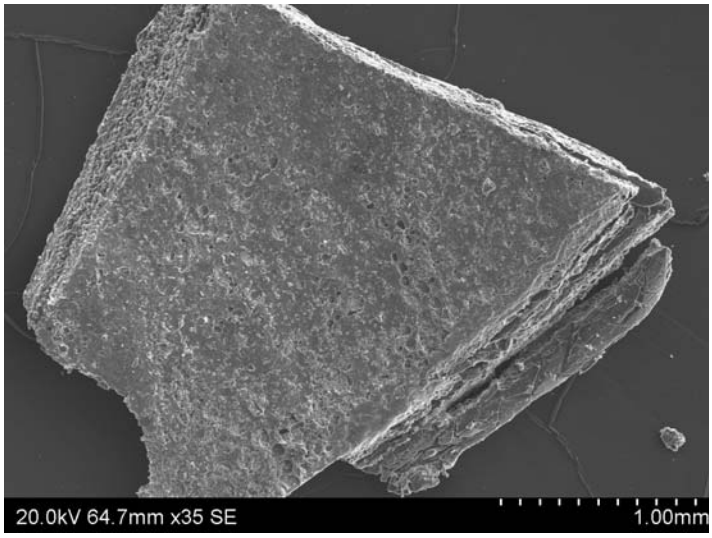


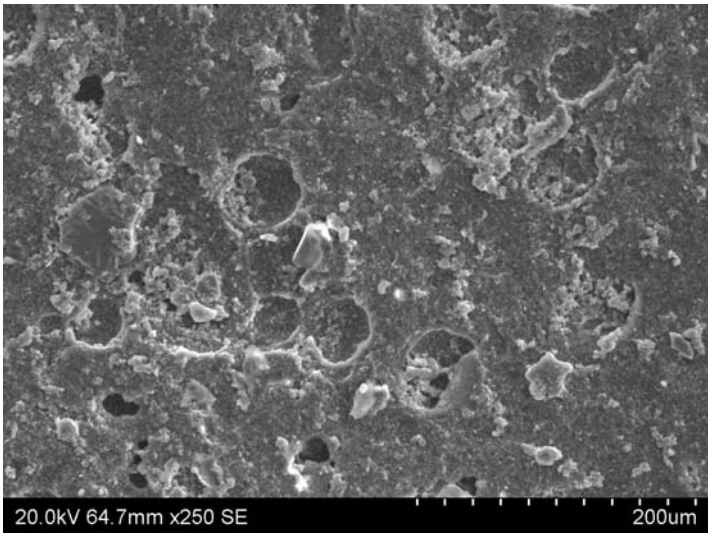
**Figure 10.115:** *CWPD x-section 4088, photographed at 200x. The graffiti paint has not been fully removed from the mural surface and the original paint layer is visibly thinned in many areas.* **Photomicrograph: Courtauld Institute CWPD 2007**



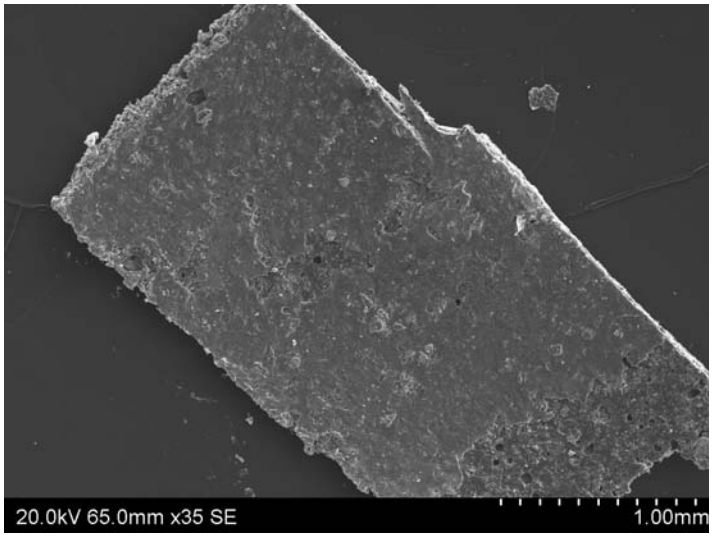



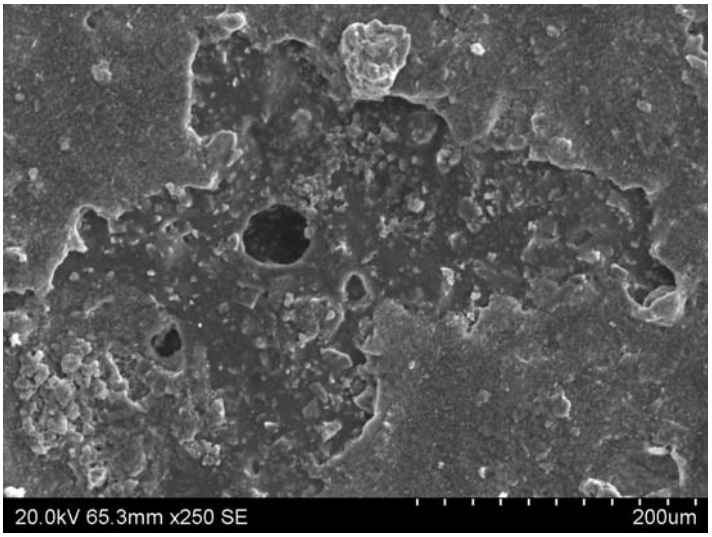

**Figures 10.116 (above left) and 10.117 (above right):** *Sample 105-012. Control sample – un-cleaned, no graffiti.* **SEM Photomicrograph: Courtauld Institute CWPD 2007**




**Figures 10.118 (above left) and 10.119 (above right):** *Sample 105-014. The sample was taken from the site of cleaning trial 105-T.12 following the successful removal of graffiti paint.* **SEM Photomicrograph: Courtauld Institute CWPD 2007**




**Figures 10.120 (above left) and 10.121 (above right):** *Sample 105-015. The sample was taken from the site slightly damaged by cleaning trial 105-T.12.* **SEM Photomicrograph: Courtauld Institute CWPD 2007**

### *Case Study 4 (106) – Untitled (3400 N. Figueroa), Peter Quezada*

*Refer to Figures 10.122 to 10.136*

#### *In situ Assessment*

No cleaning system was developed which could be successfully implemented to remove the graffiti on Quezada's mural at 3400 North Figueroa Street. The graffiti were insufficiently mobilized by all solvent and sorbent cleaning systems tested (*Figures 10.130 to 10.136*). Furthermore, the original paint materials themselves were found to be particularly weak and susceptible to all available cleaning methods (*see Appendix 4.5.6*). This is likely because the original paint materials used were probably low quality and the mural faces in a southerly direction, where it is exposed to maximum levels of direct sun and UV rays.

*Ex-situ* evaluations of cleaning trials on this mural were not undertaken as no successful system could be defined.

## 10.4.3 FTIR and PyGCMS analysis

The results of FTIR and PyGCMS analysis on the added graffiti materials (*see Appendix 5.1*) are more useful with regard to this study when assessed as a group instead of on an individual case basis. Two important overall results should be highlighted:

- For every sample analyzed, the binding media of the less-soluble graffiti material was identified as an alkyd resin.
- The binding medium identified for each of the more-soluble graffiti material samples was unique in every case. Although three out of four samples contained an acrylic component, the acrylic base was modified differently in some way.

The main conclusion which can be drawn from these results is that a vast array of materials will most certainly be present on the surface of any mural containing aerosol graffiti paint although it appears that alkyd resin paints are likely to be the most commonly encountered type. Furthermore, solubility testing of the graffiti materials will likely indicate the presence of alkyd graffiti paints whereas it will not be able to provide information on the composition of the more-soluble graffiti materials.

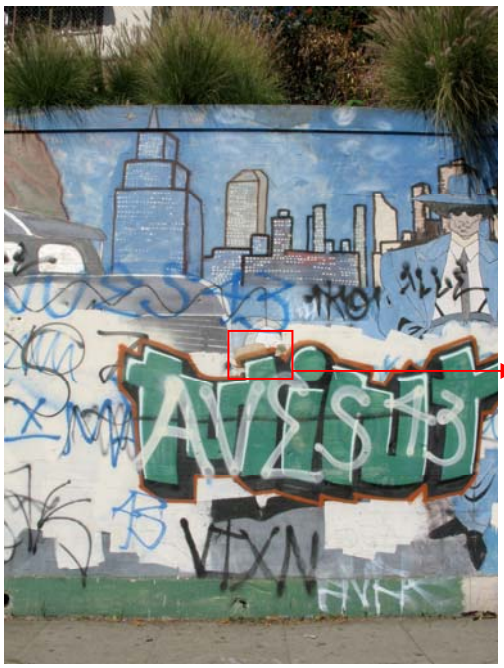
**Figure 10.122:** *Untitled mural by Peter Quezada,1990, located on the 3400 block of North Figueroa St. in Highland Park, Los Angeles, California. The mural is shown here as it originally appeared. Quezada's mural includes two monochrome scenes on the far left of the substrate wall and the adjacent cartoon scene.* **Photo: R. Dunitz 1993.**


**Figure 10.123:** *Image of the mural as it appears today. It is covered to a large extent by graffiti paint, much of which has been painted out with a solid layer of white paint only to be re-tagged.* **Photo: Courtauld Institute CWPD 2007**


**Figures 10.124 (above) and 10.125 (right):** *The monochrome section of the mural is in terrible condition today. Half of it has been obliterated entirely while the other half is cracking, peeling, and flaking heavily.* **Photo: Courtauld Institute CWPD 2007**


**Figure 10.126:** *Detail; extensive cracking and loss of the original paint layer has exposed the cement support surface and evidence of the white preparatory paint layer applied to the support surface prior to painting.* **Photo: Courtauld Institute CWPD 2007**


**Figure 10.127:** *Detail; a layer of opaque white paint has been painted over much of the mural's surface to hide existent graffiti marks.* **Photo: Courtauld Institute CWPD 2007**



**Figures 10.128 (above left) and 10.129 (above right):** *Although in strikingly better overall condition than the monochrome images, the cartoon images of the original mural do exhibit some deterioration phenomena such as cracking, flaking, and loss.* **Photo: Courtauld Institute CWPD 2007**

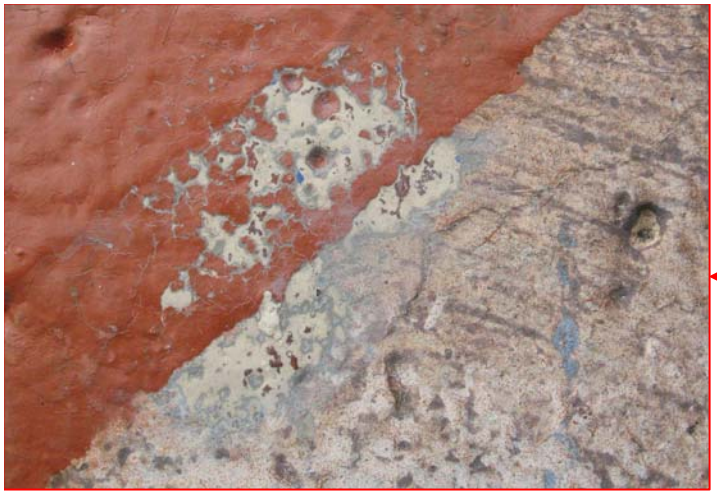


**Figure 10.131 (above):** *Results of cleaning trial 106-T.04.* **Photo: Courtauld Institute CWPD 2007**

**Figure 10.130 (above):** *Site of the most successful cleaning trial (106-T.04) on the less soluble aerosol graffiti paint.* **Photo: Courtauld Institute CWPD 2007**

**Figure 10.132 (right):** *Context image showing the site of the final cleaning trials on the more soluble aerosol graffiti paint.* **Photo: Courtauld Institute CWPD 2007**



**Figure 10.133:** *Site of final cleaning trials on the more soluble aerosol graffiti paint.* **Photo: Courtauld Institute CWPD 2007**


**Figure 10.134:** *Results of cleaning trial 106-T.08.* **Photo: Courtauld Institute CWPD 2007**


**Figure 10.135:** *Results of cleaning trial 106-T.09.* **Photo: Courtauld Institute CWPD 2007**


**Figure 10.136:** *Results of cleaning trial 106-T.010.* **Photo: Courtauld Institute CWPD 2007**

# Section 11: Discussion

## *11.1 Overview*

A cleaning system for the effective removal of aerosol paint graffiti from the surface of contemporary outdoor murals was devised for three out of four case studies tested. In each case, the developed system was far more effective and less damaging than the most suitable proprietary graffiti-removal product tested.

*Table 11.1 Summary of the successful cleaning systems developed for each of the case studies tested.*

| Case Study | Developed Cleaning System | Effectiveness of System |
|---|---|---|
| 102 | Light swab application of MPA : Stoddard solvent : Acetone (7:14:15) | Very effective and non-damaging but impractical as overly time consuming. |
| | Hot water (60-80° C) | Extremely effective if implemented with the appropriate equipment. |
| 104 | MPA : Stoddard solvent : NMP (7:7:1) Applied through Arbocel B800. Clearance through swabbing with MPA : Stoddard solvent mixture. | Initially very effective but found to be damaging upon *ex-situ* assessment. |
| 105 | MPA : Stoddard solvent : NMP (7:7:1) Applied through Arbocel B800. Clearance through swabbing with MPA : Stoddard solvent mixture. | Slightly damaging to original materials but development of a superior system is unlikely. |
| 106 | No effective treatment developed | |

However, in no case was a system devised for the removal of the *less soluble* graffiti paints encountered. These paints – which analysis has shown are likely cross-linking alkyd materials – were found to be extremely tough, particularly in comparison to the far weaker and more easily soluble acrylic emulsion original paint layers. Furthermore, the solvents in which they are likely soluble (e.g. methylene chloride) have extremely high health and environmental risks associated with their use.

Because each mural varies in composition, structure, and condition, the system required to effectively clean it must be tailored to that painting. However, due to the vast array of graffiti paint materials encountered, it was not possible to implement a single cleaning system which would effectively remove all of the graffiti on an individual mural.

The cleaning systems developed were not ideal. Some original material will almost always be lost during a cleaning intervention where the dirt is either chemically very similar to the original materials or much more durable as is generally the case for exterior contemporary murals. Moreover, when the dirt and original surface are uneven or highly topographic, achieving a homogeneous level of cleaning becomes even more difficult.

## *11.2 Conclusions*

The findings of this project suggest that there is no clear or easy solution to the problem of removal of graffiti from mural paintings. In a very recent publication on the issues of cleaning acrylic paintings in museum collections, the conclusions bear a strong resemblance to the problems encountered in the present research: 'The removal of dirt, grime, marks

and accretions from the surfaces of acrylic emulsion paintings can be highly problematic. Typical difficulties include paint solubility or sensitivity, pigment removal, gloss changes, surface tackiness and film softness. In addition, the effects of these conservation treatments on the long term stability and appearance of the acrylic emulsion paintings have yet to be ascertained' (Ormsby *et al.* 2006: 135). Beyond these physical complications of surface cleaning, contemporary murals are inherently at risk to attacks of vandalism given their outdoor, unprotected, urban settings. Preventive or protective measures which may have been effective in the past no longer are. At one time choosing mural locations set well off the ground or barred by thick vegetation may have prevented graffiti, but these tactics are no longer effective due to continuously evolving and inventive means of graffiti application. For example, with the use of a *Super Soaker* water gun which is now quite common, liquid paint can be successfully shot onto any surface from up to twelve meters away (*Figures 11.1 to 11.4*). Protective measures, particularly barrier coatings, are also problematic. In the present study the protective coating encountered on *The Bride and Groom* was seriously deteriorated. This is unsurprising since such coatings are not designed for long-term external exposure.

Within the context of remedial treatment, the results of the current cleaning tests indicated that the use of pure solvent mixtures adapted for use through a specific application methodology is both much more successful at removing graffiti aerosol paint from contemporary mural painting surfaces and far less damaging to the original materials than proprietary graffiti-removal products. This conclusion should not be surprising as the proprietary products were clearly not designed or intended for use on painted surfaces. Unfortunately, the cost of a solvent cleaning system, developed for use on a case-specific basis is high in comparison to that of an *off-the-shelf* graffiti removal product which may function, albeit poorly, on a wide range of murals. An inescapable reality is that the graffiti problem is vast and few resources – financial or otherwise – are allocated for the rectification of this problem. Neither the time nor the expertise is available for the detailed conservation of each and every mural painting in need of cleaning. This is particularly true when considering that once cleaned, the painting will more than likely be re-tagged within an *extremely* short period of time.

However, since the murals are inherently at risk, cleaning or repainting of the mural will be required at some point in the mural's lifespan if its complete abandonment is to be avoided. The results of this project have shown that cleaning – although technically the best option – will, in almost every case, damage the original painting to some extent. Although the level of damage incurred may be acceptable within the context of the individual treatment, the mural will not be able to withstand successive treatments of a similar nature which will be required to remove future acts of vandalism. Currently, it seems the only way to address this problem is to apply a protective coating to the surface of the mural. Cleaning trials have shown that the mural can be more efficiently cleaned and is less likely to be damaged when a protective layer is present between the added and original paint materials. Regrettably, such coatings are frequently problematic in their own right. Common problems include shrinking, cracking, peeling, discoloration, strong adhesion to the original paint materials, trapping of water vapour or salts within the mural, and darkening due to softening and subsequent gathering of dirt and pollution particles (May 2001: 1-3; Zakheim 1992: 1). Coatings must therefore be carefully evaluated prior to application and cannot be considered an indefinite solution. They too will require remedial treatment over the relatively short term.

If an ideal graffiti removal system is not attainable, contemporary exterior murals can still be preserved, although perhaps it is necessary to adapt the approach to their conservation. Contemporary murals face myriad threats including, but not limited to, graffiti vandalism – exterior, unprotected locations; inherent weaknesses of the painting materials; supports which are themselves vulnerable to drastic change – make these murals extremely susceptible to rapid and repeated events of damage and deterioration. Given the overall circumstances, some repainting in combination with cleaning may be necessary to the survival of the mural. Therefore, adhering strictly to a traditional conservation approach may not be feasible in the given situation.

Although the results of the current project are not overtly encouraging, they should not lead the reader to believe that the problem is entirely hopeless. Contemporary murals are important, valued works of art within their communities and often beyond. For this reason, if for no other, attempts to preserve them must and will continue. After all, 'While increasing amounts of research is being published on the analysis of acrylic paints and the historical use of acrylic paints by artists, relatively little has focused on the characterisation of the effects of surface cleaning treatments' (Ormsby *et al.* 2006: 135). Thus the subject is wide open to further research which will likely lead to advances in the surface cleaning of contemporary murals. Already this project has shown that improvements to the current commonly implemented graffiti removal systems are possible.

## *11.3 Suggestions for Further Research*

A number of issues have been touched on in this study which clearly could not be examined in depth within the current context but which warrant further research in the future.

- Use of protective or anti-graffiti coatings could be examined in terms of:
  - Intervention criteria and contra-indications;
  - materials and methods currently used and the problems or deterioration associated with them;
  - development of new, more appropriate materials and systems for the application of anti-graffiti coatings;[10]
  - long-term study of the durability, maintenance requirements and retreatment of such coatings.

- Technical aspects of surface cleaning:
  - analytical characterization of both the original and graffiti materials;[11]
  - based on analytical results, design of solvent systems;
  - further exploration of the influence of application methodology on swelling behaviour;
  - characterization of the effects of surface cleaning on the original paint materials in the short term and over time.

[10] An analogous example is the protective coating developed for the conservation of the external 14th-century mosaic of St Vitus Cathedral, Prague, a joint project of the Getty Conservation Institute, the Office of the President of the Czech Republic, and Prague Castle Administration. The coating and its application methodology were developed in collaboration with UCLA; see Bescher & Mackenzie 2004.

[11] In this respect the instrumental analysis kindly undertaken by the GCI (Dr Tom Learner, Herant Kanjian and Rachael Rivenc) for the present study makes an excellent start. Although it was not available for cleaning trials, it was extremely useful in interpreting the cleaning responses of the materials.

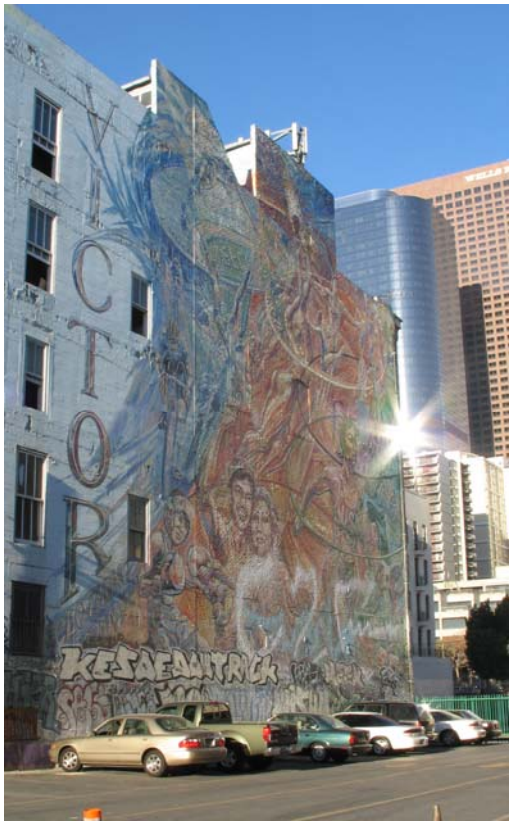
- The core of the graffiti vandalism problem also could be investigated with regard to:
  - alteration of the municipal policies for enhanced protection;
  - removal of the less soluble aerosol paint materials from availability to the general public;
  - effects of increasing the severity of consequences for those caught vandalizing a mural painting;
  - curbing graffiti vandalism by reinstating a respect for community murals amongst the tagging cultures.

  Each of these aspects is highly dependent on the motivation of the stakeholders.

**Figures 11.1 – 11.4:** *New and inventive methods of graffiti paint application are continuously evolving. For example, liquid paint applied to the wall with a 'Super Soaker' water gun is now commonplace, meaning that graffiti can be accurately shot onto a surface from up to twelve meters away.*

**Figure 11.2:** *Detail of Figure 11.1 depicting the splattered liquid paint across the mural's surface.* **Photo: Courtauld Institute CWPD 2006.**

**Figure 11.1:** *'Silent Prison' by Margaret Garcia and five deaf youth, 1984, 8th St. on-ramp to the 110 freeway north in Downtown Los Angeles, California. Today graffiti paint, which has been applied by a high-pressure water gun can be seen scrawled across the mural's surface; however, because the mural has been executed at more than six feet above ground level, graffiti would not have marred its surface in the past.* **Photo: Courtauld Institute CWPD 2006.**



**Figures 11.3 (above left) and 11.4 (above right):** *'El Nuevo Fuego (The New Fire)' by East Los Streetscapers, 1985, exterior wall of the Victor Clothing Co. Building, 240 S. Broadway St. in Downtown Los Angeles, California. Graffiti paint applied with a water gun occurs here high above the vast majority of graffiti applied to this mural by hand with aerosol spray paint.* **Photo: Courtauld Institute CWPD 2007.**

# Works Cited

**Ancelet 2006** Ancelet, J., 'The history of graffiti', http://www.ucl.ac.uk/museumstudies/websites06/ancelet/thehistoryofgraffiti.htm, accessed 2/28/2007, 2006.

**Baca 2002** Baca, J., 'Public participation in conservation 1: *The Great Wall of Los Angeles*', *Conservation and maintenance of contemporary public art: a conference hosted by the Cambridge Arts Council, Cambridge, Massachusetts, October 26-28, 2001*, H. Yngvason (ed.), Archetype Publications, London, 2002, 21-29.

**Banks & Rutledge 1999** Banks, B., and Rutledge, S., 'Use of an atmospheric atomic oxygen beam for restoration of defaced paintings', *12th Triennial Meeting Lyon 29 August – 3 September 1999*, J. Bridgland (ed.), ICOM, Preprints v. 1, 1999, 271-75.

**Bescher & Mackenzie 2004** Bescher, E., and Mackenzie, J., 'The Last Judgement mosaic: development of coating technologies', in F. Piqué and D. Stulik (eds.), *Conservation of the Last Judgment mosaic, St Vitus Cathedral Prague*, Los Angeles, 2004, 177-87.

**Budavari 1996** Budavari, S. (ed.), *The Merk index: an encyclopedia of chemicals, drugs, and biologicals*, twelfth edition, Merck & Co. Inc., Whitehouse Station, 1996.

**Cather 2003** Cather, S., 'Assessing causes and mechanisms of detrimental change to wall paintings', *Conserving the painted past: developing approaches to wall painting conservation* [post-prints of a conference organized by English Heritage, London, 2-4 Dec. 1999], James & James (Science Publishers), London, 2003, 64-74.

**Cather 2006** Cather, S., *PowerPoint presentation*, 2006/05/16.

**Cockcroft et *al.* 1977** Cockcroft, E., Cockcroft, J., and Weber, J., *Toward a people's art: the contemporary mural movement*, E.P. Dutton & Co., Inc., New York, 1977.

**Columbia Electronic Encyclopedia 2007** 'Work Projects Administration', *The Columbia Electronic Encyclopedia*, 6th ed., Columbia University Press, http://www.infoplease.com/ce6/hisroty/A0852725.html, accessed 4/4/2007, 2007.

**Crook & Learner 2000** Crook, J., and Learner, T., *The impact of modern paints*, Tate Gallery Publishing Ltd., London, 2000.

**Curteis 1991** Curteis, T., 'An investigation of the use of solvent gels for the removal of wax-based coatings from wall paintings', postgraduate diploma dissertation, Courtauld Institute of Art, Conservation of

Wall Painting Department, London, 1991.

**Drescher 2003** Drescher, T., 'Priorities in conserving community murals', in GCI 2003, 1-14.

**Dunitz 1993** Dunitz, R., *Street Gallery*, RJD Enterprises, Los Angeles, 1993.

**English Heritage 1999** English Heritage, 'Graffiti on historic buildings and monuments: methods of removal and prevention', *Technical advice note*, English Heritage, London, 1999.

**Franchi dell'Orto & Varone** Franchi dell'Orto, L., and Varone, A. eds., *Rediscovering Pompeii*, Exhib. cat., Bretschneider, NY, Houston, Malmö, London, 1992.

**Garfinkle 2003** Garfinkle, A., 'The legal and ethical consideration of mural conservation: issues and debates', in GCI 2003.

**GCI 2003** Getty Conservation Institute, 'Mural painting and conservation in the Americas' [Compilation of papers presented at a symposium organized by the Getty Conservation Institute, Los Angeles, 16-17 May, 2003], The J. Paul Getty Trust, Los Angeles, 2003.

**Golden & Jablonski 2001** Golden, M., and Jablonski, E., 'The conservation cleaning of acrylic dispersion paint films: preliminary investigations', *Deterioration of artists' paints: effects and analysis* [Extended abstracts of presentations from a joint meeting of ICOM-CC Working Groups Paintings 1&2 and The Painting Section, UKIC, at the British Museum, London, 10th and 11th September, 2001], ICOM and UKIC, London, 2001.

**Golden *et al.* 2003** Golden, M., Hayes, J., Jablonski, E., and Learner, T., 'Conservation concerns for acrylic emulsion paints', *Reviews in Conservation*, Number 4, IIC, London, 2003, 3-11.

**graffitihurts.org 2007** Graffiti Hurts, 'Learn more: how does graffiti "hurt"?', http://www.graffitihurts.org/learn_more/how_does_graffiti_hurt.cfm, accessed 3/23/2007, Keep America Beautiful Inc., 2007.

**Graves 2007** Graves, K., 'An investigation into the technology and behaviour of contemporary murals executed on Portland cement-based supports', unpubl. MA dissertation, Conservation of Wall Painting Department, Courtauld Institute of Art, 2007.

**Haithman 2006** Haithman, D., 'Artist Twitchell sues over the disappearance of his "Ruscha"', *Los Angeles Times,* latimes.com, 8/5/2006, 2006.

**Historic Scotland 2005** Historic Scotland, 'Graffiti and its safe removal', *INFORM: information for historic building owners*, Technical Conservation, Research and

Education Group, Edinburgh, June, 2005.

**Jönsson & Learner 2004** Jönsson, J., and Learner, T., 'Separation of acrylic paint components and their identification with FTIR spectroscopy', *Proceedings of the sixth infrared and Raman users group conference (IRUG6)* [Compilation of papers presented at a symposium organized by the Instituto di Fisica Applicata *"Nello Carrara"* IFAC-CNR in collaboration with Opificio delle Pietre Dure and Ente Cassa di Risparmio di Firenze, Florence, Italy March 29th – April 1st 2004], M. Picollo (ed.), Florence, 2004.

**Keddie *et al.* 1995** Keddie, J.L., Meredith, P., Jones R.A.L., and Donald, A.M., 'Kinetics of film formation with emulsion copolymers', *Macromolecules*, 2006, 28:2673-82.

**LACAD 1993** City of Los Angeles Cultural Affairs Department (LACAD), 'Los Angeles mural assessment and conservation project, survey report: 218, *Untitled*', Los Angeles, 1993.

**LACAD 1999** City of Los Angeles Cultural Affairs Department (LACAD), 'Los Angeles mural assessment and conservation project, revisit report: 39a and 39b, *Untitled*', Los Angeles, 1999.

**LACAD 2002** City of Los Angeles Cultural Affairs Department (LACAD), 'Los Angeles mural assessment and conservation project, revisit report: 1341, *Flow Inversion*', Los Angeles, 2002.

**Learner 2000** Learner, T., 'A review of synthetic binding media in twentieth century paints', *The Conservator* 2000 (24) 96-103.

**Learner 2001** Learner, T., 'The analysis of synthetic paints by Pyrolysis-Gas Chromatography-Mass Spectrometry (PyGCMS)', *Studies in Conservation*, 2001 (46) 225-41.

**Learner 2004** Learner, T., *Analysis of modern paints*, Getty Publications, Los Angeles, 2004.

**Maese 2007** Maese, K., 'The big pictures' big problems: Victor Clothing developer seeks to restore damaged murals, including Anthony Quinn artwork', *Los Angeles Downtown News.com*, http://www.downtownnews.com/articles/2007/01/29/news/news02.txt, 2007.

**Martin de Fonjaudran 2004** Martin de Fonjaudran, C., 'Removing non-original varnishes from two oil-based wall paintings: an investigation of the intervention criteria and assessment of selected cleaning methods', MA dissertation, Courtauld Institute of Art, Conservation of Wall Painting Department, London, 2004.

**May 2001** May, D., 'A necessary evil: anti-graffiti coatings for murals' [As

presented at the Western Association for Art Conservation 2001 Annual Meeting, October 11-13, 2001, J. Paul Getty Museum], Los Angeles, 2001.

**Mindess *et al.* 2002** Mindess, S., Young, J.F., and Darwin, D., *Concrete*, 2nd ed., Prentice Hall, 2002.

**Moncrieff & Weaver 1987** Moncrieff, A., and Weaver, G., *Science for conservators, Vol 2: Cleaning*, The Conservation Unit, Museums & Galleries Commission, London, 1987.

**Obiospo 2007** Obiospo, H., 'Background of East Coast graffiti: the beginnings 1966-1971', http://www.africaresource.com, accessed 4/4/2007, 2007.

**Ormsby *et al.* 2006** Ormsby, B., Learner, T., Schilling, M., Druzik, J., Khanjian, H., Carson, D., Foster, G., Sloan, M., 'The effects of surface cleaning on acrylic emulsion paintings – a preliminary investigation', *Oberflächenreinigung – material und methoden (Surface cleaning – material and methods)*, Verband der Restauratoren, Düsseldorf, 2006, 135-49.

***PC* Baca 2007** Personal Communication with Judith Baca, Founder and Artistic Director of the Social and Public Art Resource Center (SPARC), January 29, 2007.

***PC* Estrada 2006** Personal Communication with John Zender Estrada, December 19, 2006.

***PC* Moreno 2006** Personal Communication with Vincent Moreno, Caltrans District 7 Adopt-a-Highway Coordinator, December 8, 2006.

***PC* Quezada 2007** Personal Communication with Peter Quezada, Artist, January 19, 2007.

***PC* Rainer 2007** Personal Communication with Leslie Rainer, Private Conservator and the GCI Senior Project Specialist, January 31, 2007.

***PC* Sellers 2006** Personal Communication with Janet Lee Sellers, Artist, December 18, 2006.

***PC* Twitchell 2006** Personal Communication with Kent Twitchell, Artist, December 20, 2006.

***PC* Twitchell 2007** Personal Communication with Kent Twitchell, Artist, March 9, 2007.

**Phenix 1997** Phenix, A., 'Solvent Abuse: some observations on the safe use of solvents in the cleaning of painted and decorated surfaces', *The Building Conservation Directory*, Cathedral Communications Limited, Wiltshire, 1997.

**Phenix 1998** Phenix, A., 'Solubility parameters and the cleaning of paintings: an update and review', *Zeitschrift für Kunsttechnologie und Konservierung*, 1998 (12) 387-408.

**Pounds 2003** Pounds, J., 'The gift of absence: mural restoration in a policy void', in GCI 2003.

**Pritchard 1967** Pritchard, V., *English medieval graffiti*, Cambridge University Press, Cambridge, 1967.

**Rainer 2003** Rainer, L., 'The conservation of outdoor contemporary murals', *The Getty Conservation Institute Newsletter*, 2003 (18/2) 4-9.

**Rainer *et al.* 2002** Rainer, L., Stavroudis, C., Williams, D., and Zebala, A., 'Where to start when the city is full of art – the Los Angeles mural assessment and conservation project', *Conservation and maintenance of contemporary public art: a conference hosted by the Cambridge Arts Council, Cambridge, Massachusetts, October 26-28, 2001*, H. Yngvason (ed.), Archetype Publications, London, 2002, 107-113.

**Redman 1997** Redman, C., 'Cellulose sorbents used in the conservation of wall paintings: an evaluation of their characteristics and properties', postgraduate diploma dissertation, Courtauld Institute of Art, Conservation of Wall Paintings Department, London, 1997.

**Saulnier & Thibault 2005** Saulnier, G., and Thibault, M., 'Cleaning acrylic emulsion paint; a two-part study', *AIC paintings specialty group postprints*, 2005 (17) 1-7.

**Several 1999** Several, M., 'Bride and Groom: historical background', http://www.publicartinla.com/Downtown/Broadway/victor/bride_groom1.html, accessed 3/7/2007, 1999.

**Several 2000** Several, M., 'Flow Inversion project: inverted freeway', http://www.publicartinla.com/LA_murals/USC/flow.html, accessed 3/5/2007, 2000.

**Stack 2003** Stack, S., *Graffiti remover research and field test report: the search for safer products*, The Center for a New American Dream, Portland, 2003.

**Thompson 1995** Thompson, D., (ed.), *The concise Oxford dictionary of current English*, 9th ed., Clarendon Press, Oxford, 1995.

**Weaver 1995** Weaver, M., 'Removing graffiti from historic masonry', *Preservation Brief 38*, http://www.cr.nps.gov/hps/tps/briefs/brief38.htm, National Park Service, U.S. Department of the Interior, Washington, DC., accessed 20/10/2006, 1995.

**Weber 2003** Weber, J., 'Politics and practice of community public art: whose murals get saved?', in GCI 2003.

**Whitford 1992** Whitford, M., *Getting rid of graffiti: a practical guide to graffiti removal and anti-graffiti protection*, E & FN Spon, London, 1992.

**wikipedia.org/ Graffiti 2007** 'Graffiti', http://en.wikipedia.org/wiki/Graffiti, accessed 3/23/2007, 2007.

**wikipedia.org/ Contemporaryart 2006** 'Contemporary art', http://en.wikipedia.org/wiki/Contemporary_art, accessed 8/13/2006, 2006.

**wikipedia.org/ Gesso 2007** 'Gesso', http://en.wikipedia.org/wiki/Gesso, accessed 3/23/3007, 2007.

**wikipedia.org/ Iconoclasm 2007** 'Iconoclasm', http://en.wikipedia.org/wiki/Iconoclasm, accessed 3/18/2007, 2007.

**Zakheim 1992** Zakheim, N., 'Soluvar: the mural varnish of the future', *Mural Conservancy of Los Angeles (MCLA) Newsletter*, MCLA, Los Angeles, v. 4, pp. 1-2, 1992.