CHAPTER 5 – SHORELINE CLEANUP ASSESSMENT TECHNIQUES (SCAT)

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Introduction

This chapter is designed to facilitate the SCAT process during a marine oil spill. The chapter is two linked parts:

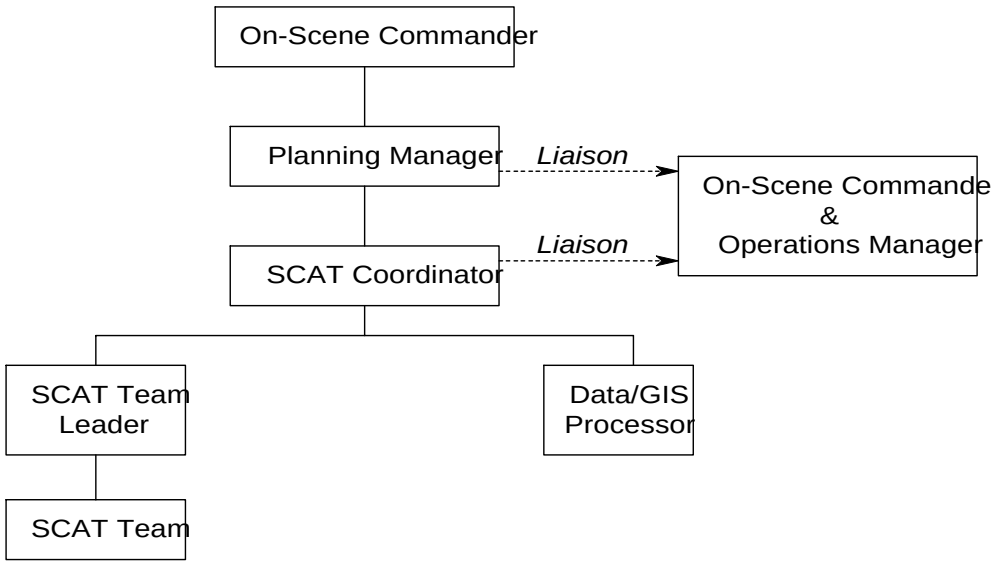
- SCAT Standard Operating Procedures
  - Summarises the key operational aspects in the Foreshore Assessment process.
- SCAT Supporting Information
  - Provides detail on the key aspects.

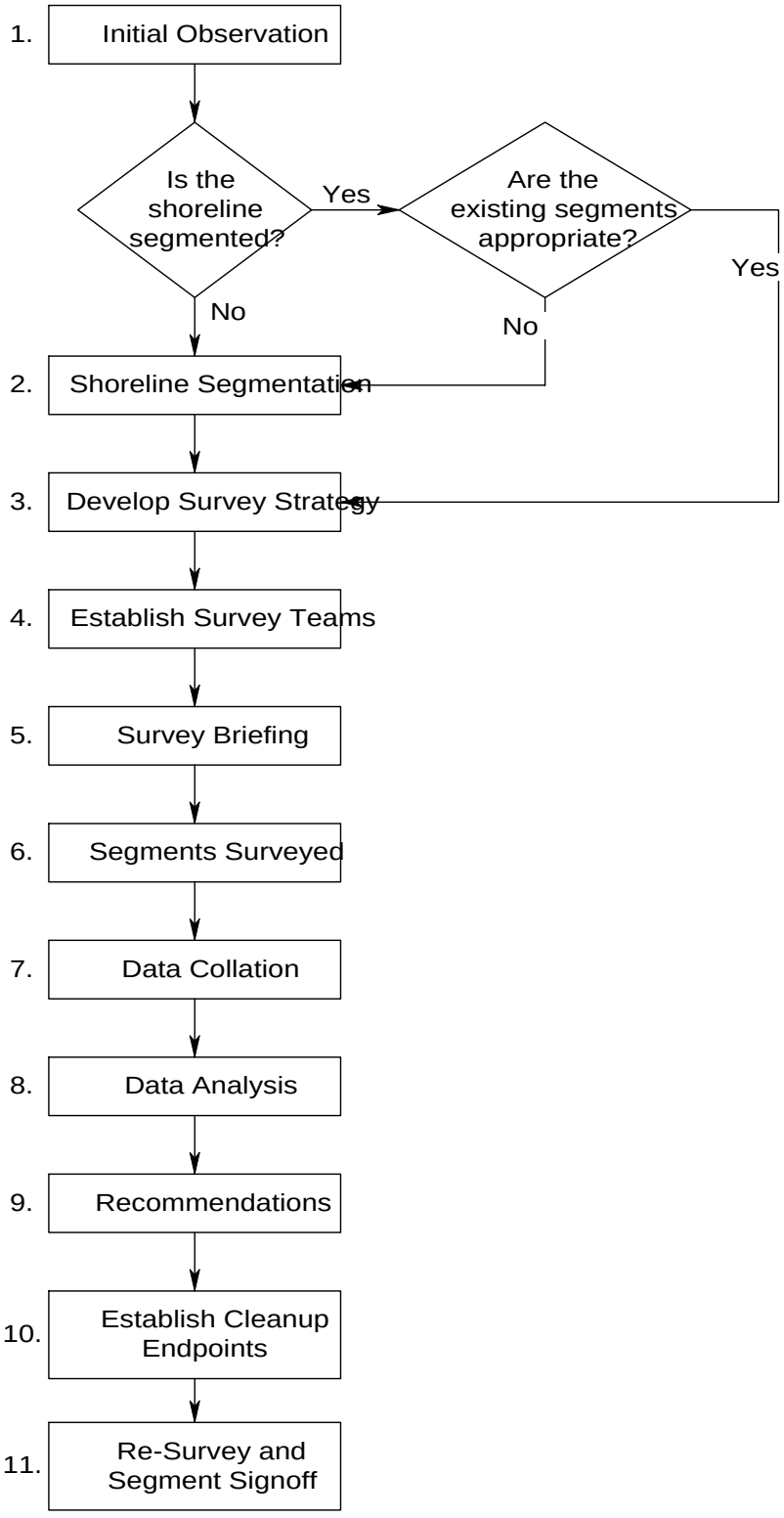
SCAT objectives

- To provide decision support for onshore response operations.
- SCAT surveys provide a spatial description and documentation of shoreline oiling.
- Data provides the basis for cleanup evaluation and decision-making.
- The role of the SCAT teams is to be the 'eyes and ears' of the Planning and Operations teams.

NZ SCAT response structure

- Apply the existing incident response team structure.
- Modular structure for the integration of SCAT.
- SCAT function sits within the planning section.
- Strong and direct links with the operational team and the On-Scene Commander.




1.
Initial Observation
Is the shoreline segmented?
Yes
Are the existing segments appropriate?
Yes
No
No
2.
Shoreline Segmentation
3.
Develop Survey Strategy
4.
Establish Survey Teams
5.
Survey Briefing
6.
Segments Surveyed
7.
Data Collation
8.
Data Analysis
9.
Recommendations
10.
Establish Cleanup Endpoints
11.
Re-Survey and Segment Signoff

Support Information

1. Initial observation

Purpose To make specific observations, but not to map or document the oiling conditions, so that relatively large areas can be covered in a relatively short time period.

Actions

- Generally done by aerial reconnaissance.
- Provides a general picture on the extent and character of the oiled shorelines.
- Information used to develop response objectives and to define the overall scale of the response operation.

2. Shoreline segmentation

Purpose To divide the coast into working units called segments, within which the shoreline character is relatively homogenous in terms of physical features and sediment type.

Actions

- Each segment given unique identifier.
- Segment boundaries can be either:
  - prominent geological features (e.g. headland), or
  - changes in oiling conditions.
- Segment lengths typically 0.2 – 2 km long.
- Existing segmentation may be available in the form of a GIS database or as part of pre-spill planning.
  - May need to be reviewed and compared to oiling conditions in the field if oiling conditions vary significantly within the segment, segments could be subdivided.

3. Survey strategy

Purpose To determine the best method(s) for surveying the affected coastline and plan survey.

Shoreline surveys can be conducted by different methods and at different scales depending on the size of the affected area, the character of the coastal area, and the level of detail required.

For pre-survey planning:

- Decide on segments to be surveyed based on survey priorities, logistics, low-tide window and associated logistics.
- Decide on method of survey: aerial survey, systematic ground survey, spot ground survey.
- Select alternate areas in case weather conditions prevent access to primary target(s).
- Collect all necessary equipment and supplies.
- Review existing information and data.

SURVEY METHOD	KEY OBJECTIVES
Aerial Survey	Systematically document or map to: 1 create segments, 2 develop regional strategies and plans, and 3 define lengths of oiled shoreline.
Systematic Ground Survey	Systematically document shoreline oiling conditions in all segments within the affected area.
Spot Ground Survey	Systematically document shoreline oiling conditions for selected segments within the affected area.

Aerial survey

Purpose To prepare a map or maps that show the locations of stranded oil and the distribution and character of that oil.

Actions

- Documents the oil in a systematic manner.
- Typically use video mapping techniques.
- Foundation for the development of:
  - segmentation of shoreline, and
  - definition of lengths of oiled shoreline in terms of shoreline types and the oil character.
- May be the only practical method available to survey in areas with inaccessible shorelines or difficult access.

Systematic ground survey

Purpose To systematically document shoreline oiling conditions in all segments within the affected area and to complete shoreline oiling summary forms and generate sketch maps for each segment.

Actions

- A ground team systematically assesses each segment in the affected area.
- Shoreline oiling summary forms completed, sketch maps, photographs and video used to record oiling conditions.
- Foreshore Assessment Coordinator responsible for managing survey teams.

Spot ground survey

Purpose To systematically document oiling conditions for selected segments within the affected area and to complete shoreline oiling summary forms and generate sketch maps for those segments.

Actions

- Used to focus on specific locations if the aerial survey identifies discontinuous oiling conditions or if treatment or cleanup is planned only for selected segments within the affected area.
- Shoreline oiling summary forms completed, sketch maps, photographs and video used to record oiling conditions.

4. SCAT teams

Purpose Foreshore Assessment teams undertake the surveying of the affected coastline.

Number of SCAT teams

Required amount of teams depends on the complexity of the affected area and the required turnaround time for the information. In general, the required scale is “however many teams it takes to cover that area in time to provide the information”.

SCAT team composition

The ideal composition of a team would combine:

- an individual with oil spill experience and SCAT training who can identify and document oil on the shore from the air or on the ground;
- an individual familiar with coastal ecology of the affected area who can document the impacts of the oil and who can recommend priorities and cleanup endpoints;
- in areas where archaeological or cultural resources exist, a specialist who can advise on precautions and constraints to protect those resources; and
- a representative from the operations team who can identify feasibility issues, logistical constraints and solutions, and who can evaluate the types of resources and level of effort that might be required for cleanup or treatment of a segment.

When it is not possible for agency and other representatives to participate directly in the field surveys, a review team or committee can be established to develop recommendations for priorities based on the information generated by the field teams.

5. Survey briefing

Purpose To brief SCAT teams on all aspects of the surveying task to ensure consistency between SCAT teams and segments.

Before SCAT teams undertake surveys, the SCAT Coordinator should brief them on the following:

- Survey objectives.
- Survey area.
- Methodology.
- Forms.
- Safety.

6. Segments surveyed

Purpose To collect data from the field for analysis by the SCAT Coordinator.

Field equipment checklist

The following is a checklist of equipment that can be used by the field teams:

Survey gear

- waterproof paper for field forms and sketch maps; field notebooks (waterproof)
- job aids
- office supplies; pencils, paper, waterproof markers, rulers, paperclips, clipboard
- segment maps and base sketch maps (if available), topographic or nautical charts of area
- compass, liquid filled, 1-degree graduations, Brunton types are preferable if bearings are recorded
- shovels; folding or clam, preferably with the pick on the backside
- Global Positioning System (GPS) receiver (hand-held, portable)
- tape measure or range finder (hand-held, 0-500 m or greater range)
- digital camera that can date the photos
- video camera and videotapes, if required
- batteries, charged battery packs (for cameras, radios, etc.)
- 10-cm long photo scale with 1-cm increments for close-ups
- day pack (waterproof)
- communication equipment (hand-held 2-way radio(s), VHF Marine (5 watt), cellular phones)

Personal gear

- rain gear
- sun screen, hat, rubber boots, non-skid soles
- gloves & liners, waterproof, work type, high quality
- first aid kit

Aerial surveys

An aerial reconnaissance requires prior experience as this technique relies heavily on the ability of the observer(s) to identify substrate materials and oil and to distinguish oil from the many other materials of similar colour and texture that occur naturally on the shoreline (lichen, mussel beds, heavy mineral deposits, stranded seaweed or sea grasses, peat, etc.).

Typical steps for an aerial reconnaissance include:

- define the low-tide window;
- decide on area or segments to be surveyed, the flight line direction, and associated logistics;
- collect all necessary equipment and supplies;

- review existing information and data;
- brief all team members on the survey's objectives, methodology, and safety concerns;
- take photos (or record videotapes if planned);
- fill in flight-line maps, appropriate forms, etc., record GPS waypoints, or take notes to be able to complete forms later;
- discuss assessments / major observations prior to return from the survey;
- finalise and copy all maps, forms, field notes and photo/videotape logs;
- submit copies to the SCAT Coordinator or Data Manager;
- file a daily report form with the SCAT Coordinator; and
- review day's activities, discuss improvements, and prepare for next day, if necessary.

Key elements of a successful Aerial Videotape Mapping Survey include:

- flight-path planning with respect to (tidal) water levels, sun angles, and flying altitude;
- communication with the pilot regarding flying height and distance from shore to minimize camera work (e.g. use of the zoom lens) and to ensure complete coverage;
- a "rule of thumb" that a point on the ground passes through the video image for approximately six seconds;
- accurate flight-line data that are linked to the tapes (for example, automatic GPS data logging);
- ground calibration where it is difficult to distinguish shoreline features;
- continuous commentary using the video image as the background for the observations that are documented on the audio channel; and
- open-window or open-door for the camera and a mouth microphone for the observer (to minimize wind sounds).

Ground surveys

General elements of a ground survey include:

On-site activities

- Conduct segment overview; gain an overall perspective.
- Complete observations and measurements of the segment. Take photos and/or videotapes.
- Draw sketch maps.
- Fill in required forms, or take appropriate notes to be able to complete forms later.
- Discuss assessments/major observations prior to departure.

Post-survey activities

- Finalise and copy all forms, maps, field notes and photo/videotape logs.
- Submit copies to the SCAT Coordinator or Data Manager. File a daily report form with the SCAT Coordinator.
- Review day's activities, discuss improvements, and prepare for next day, if necessary.

Specific details of the on-site activities within each segment include:

Segment overview on arrival

On arrival at the site, traverse the entire segment by skiff or helicopter, or if operating from a vehicle, view the segment from an elevated vantage point in the backshore to:

- verify if the pre-determined segment boundaries are correct,
- acquire a good perspective of the extent of stranded oil, and
- estimate the level of *effort* required to complete the assessment.

If working from vessel or aircraft, conduct a radio check before departing and agree on calls, channels, and ETA’s (estimated times of arrival) with the captain or pilot.

Survey strategy

Once on shore, the team spreads out and begins walking from one end of the shoreline to the other while observing and documenting important oil features. If little or no oil is observed and treatment is not recommended, only a cursory assessment is required of ecological or cultural resource features.

- On short segments: walk the entire segment while making general observations and then return to areas that require more detailed documentation.
- On long segments: it is more efficient to make extensive notes as team members progress along the shore, to avoid backtracking.

- Site activities consist of systematic observing, collecting and documenting of the information on field forms, sketches, maps, and by photo and videotape recording methods.
- Completion of the Shoreline Oiling Summary Form (Section 1.5) focuses on the physical aspects of the shoreline and the oiling conditions (typically, the mid- and upper-intertidal zones).
- If present, an ecologist would focus on the biological environment, and typically would concentrate near the lower intertidal/swash zone (usually the most ecologically productive area).
- If present, an archaeologist would typically focus on the supratidal and backshore regions, as this is where most archaeological or cultural features would be found.
- If operations or agency personnel are present on the assessment team, then they can assist in a variety of ways (e.g., photos, measuring, documentation, digging pits, etc.) as well as assessing operations features such as access, potential staging areas, safety issues etc.
- Sketch maps are generated and photos/videotapes taken.

Prior to departing the site

- As a team, review the individual assessments and discuss treatment or cleanup options to ensure nothing has been overlooked, and reach agreement on major points. At a minimum there must be a consensus on oil character and distribution.
- Check that forms and sketch maps are complete and consistent, or ensure that adequate notes and measurements have been taken to complete them later.
- Ensure that all photographs and videotapes have been accurately logged in the field notes and that all of the documented and unusual features of the segment have been photographed.
- Check that all equipment, survey gear, personal items, and litter are taken when leaving the site.

7. Data collection

Foreshore Assessment teams into information available for analysis by the SCAT Coordinator.

Data management

- Spill response generate large volumes of data.
- Data must be rapidly processed and analysed.
- Data must be made available quickly to decision makers especially at the start of a response.
- SCAT data needs to be assessed for accuracy and consistency.

8. Data analysis

Purpose To analyse the field survey information and make recommendations for appropriate response options.

Evaluation process

- Collect information on:
  - physical characteristics of the impacted area,
  - ecological factors, and
  - human-use factors.
- Assess priorities for protection based on the information collected.
- Predict likely outcomes if proposed response is used versus natural cleanup.
- Compare and weigh advantages and disadvantages of response options with those of natural cleanup – NEBA.

Use and application of data

Incident Command

- Evaluate the scale of the problem and scope of response.

Planning section

- Define shoreline treatment priorities.

- Select cleanup methods.
- Identify level of effort for shoreline operations.
- Apply cleanup endpoint criteria and monitor cleanup task.

Operations
- Locate work sites and to implement cleanup tasks.
- Determine what and how much waste will be generated at each site.

Environmental
- Identify potential liabilities.
- Assess effects and recovery.

OSH
- Identify shore-zone hazards and other site-specific safety issues.

Assessment of priorities
Identify "most at risk" resources, considering the following:

- ecological value;
- socio-economic value; and
- most sensitive to oiling – recovery time.

Ecological Risk Assessment
- Tool to undertake comparative analysis of impacts of an oil spill.
- Allows for assessment of different environmental compartments.

9. Recommendations

Purpose To recommend priority areas for cleanup and preferred cleanup options.

Recommendations are made by the SCAT Coordinator to the Planning/Operations Manager, OSC.

10. Cleanup endpoints

Purpose To establish a measured end of treatment or cleanup activities. The treatment or cleanup for a segment is completed when the endpoint has been attained, i.e. when the standard or measure has been achieved.

- Establish treatment objectives for a specified area before response operation begins.
- Define end points of the cleanup, treatment or restoration activities so that operations team will know when they have completed a task.
- Bring closure to the response activities so that the operations can demobilise.

Actions
- End point achieved by human intervention techniques or by allowing natural cleaning processes without intervention.
- Need to make a decision about when to stop clean-up at the outset of a response.
- Cleanup endpoint for any and each particular segment of shoreline, must be determined by the interested parties – the stakeholders:
  - responsible party,
  - regulators,
  - local government/residents,
  - public, and
  - iwi.

Cleanup endpoints for shoreline types

Example cleanup endpoints are listed below. Each spill will have a unique combination of oil type, rate of natural recovery, biological sensitivity, and human use issues that may lead to different endpoints.

SHORELINE TYPE	CLEANUP ENDPOINT
Exposed rocky shores and wave cut platforms	Cleanup can be terminated when the shoreline no longer generates sheens that affect sensitive wildlife. On exposed rocky shores used as seal haulouts, persistent oil should be removed until the oil is no longer sticky, unless cleanup is determined to be too disruptive to animals at the site.
Solid man-made structures	In industrial areas, cleanup can be terminated when the shoreline no longer generates liquid oil and heavy rainbow sheens. In areas of high public use, more intensive cleanup should be conducted to remove the oil until it no longer rubs off on contact. In areas of low public use, visible oil can remain as stain and patches of coat.
Sand Beaches	Cleanup can be terminated when there is no visible oil on the surface. All tarballs or tar patties that could be removed by reasonable cleanup techniques or that could be remobilised should be removed. Remaining tarballs and patties should be at or below normal background frequency. Cleanup can be terminated when no layers of oil are found in trenches dug into the beach.
Mixed sand and gravel beaches	Cleanup can be terminated when all liquid oil in the sediments has been removed. No more than a stain may remain on the gravel-sized sediments. There should be no oil layers in pits dug. Buried tarballs should be at or below background frequency. Removal of subsurface oil should be terminated when further cleanup efforts will result in excessive habitat disruption that will cause more harm than natural removal of oil residues.
Riprap structures	In industrial areas, cleanup can be terminated when the shoreline no longer releases liquid oil and heavy rainbow sheens. Visible oil can remain as stain and patches of coat on the outer surface of the structure. All flushable oil in the crevices and on the sides and bottom of individual pieces of the riprap should be removed. In areas of high public use, more intensive cleanup should be conducted to remove the oil until it no longer rubs off on contact.
Exposed and sheltered tidal flats	Cleanup can be terminated when the shoreline no longer releases sheens that will affect sensitive areas, wildlife, or human health. Gross oil removal can be terminated when further cleanup efforts will result in excessive habitat disruption that will cause more harm than natural removal of oil residues.
Marshes	Cleanup can be terminated when there is no more free-floating oil in the marsh and when the shoreline no longer releases sheens that will affect sensitive areas, wildlife, or human health.

Michel, J. and B. Benggio, 1999. “Guidelines for Selecting Appropriate Cleanup Endpoints at Oil Spills”.

11. Survey and segment signoff

Purpose Segments are surveyed to see if cleanup endpoints have been met.

Signoff that a cleanup endpoint has been reached for any and each particular segment of shoreline, must be determined by the interested parties – the stakeholders:

- responsible party,
- regulators,
- local government/residents,
- public, and

- iwi.

New Zealand Shoreline Oiling Summary (SOS) Form _____ Incident Page ___ of ___

1 General Information	Date (mmm/dd/yyyy)	Time	Water Level	Temperature	Wind Speed
Segment ID:		From			
Operations Division		To		(C)	(km/h)
Surveyed By:Foot / ATV / Boat / Helicopter / Overlook /					

2 Survey Team #

Name	Organization	Phone

3 Segment **Total Segment Length:** _____ m **Segment Length Surveyed:** _____ m

Coordinates *Dec. Deg* *Start* Latitude: _____ Longitude _____
End Latitude: _____ Longitude _____

4A Shoreline Type(s) *select only one Primary (P) shoreline type and any Secondary (S)*

	Bedrock	Man-Made Solid	Volcanic
Vertical	%	%	%
Sloping	%	%	%
Platform	%	%	%

Man Made Permeable (Rip Rap) ____ %

Sediment Beach		Sediment Flats	
Boulder	%	Mud	%
Pebble-Cobble	%	Sand	%
Mixed Sand Gravel Shell	%	Mixed Sand Gravel	%
Sand	%	Pebble-Cobble	%

Wave Exposure (Open Coast/Partially Exposed/Sheltered) ____
Slope (Steep-Vertical/Moderate/Low-Flat) ____

Mangrove ____ %
Marsh/Wetland ____ %

4B Coastal Character *select only one Primary (P) shoreline type and any Secondary (S)* ___

Barrier beach ___	Broken Shell (Chenier) Bank ___	Developed/Man made ___	Platform/Terrace ___
Beach with Dune ___	Cliff - Consolidated ___	Estuarine/tidal inlet ___	Spit ___
Beach without Dune	Cliff - Unconsolidated	Lagoon	Tidal Flats

5 Operational Features Suitable Backshore Staging Area ☐ Debris Present Oiled ☐ Debris Amount ____ (m3 / Bags / Trucks)

Access: Direct Backshore ☐ Alongshore ☐ Road ☐ Jetty, Dock, Ramp ☐ Accessibility *No Restriction / ATV / Foot / Restricted*

Restrictions: Long walk

6 Surface Oiling Conditions

Oil Zone ID	Interidal Zone				Oil Cover			Oil Thickness					Oil Character								Substrate Type(s)								
	LI	MI	UI	SU	Length (m)	Width (m)	Distrib (%)	PO	CV	CT	ST	FL	FR	MS	TB	PT	TC	SR	AP	NO	R	B	C	P	G	S	M	A	V
A																													

7 SubSurface Oiling Conditions

Trench or Pit #	Intertidal Zone				Max Pit Depth (cm)	Oiled Zone (cm- cm)	Oil Character							Water Table (cm)	Sheen Colour				Substrate Type(s)						
	LI	MI	UI	SU			SAP	OP	PP	OR	OF	TR	NO		B	R	S	N	B	C	P	G	S	M	V
1																									

8 Comments (Cleanup Recommendations - ecological/recreational/cultural/economic issues constraints - Wildlife obs.)

Grrr

Sketch ☐ Photos: ☐ Roll # _____ Frames _____ Videotape No _____