APPENDIX B

PROTOCOL FOR

AVOIDING AND MINIMIZING IMPACTS

TO THE

COLUMBIA SPOTTED FROG

(Rana luteiventris)

DURING CONSTRUCTION

Appendix B

General Considerations before Impacting Spotted Frogs Sites

Before planning mitigation activities for a frog site, the following conditions should be assessed: (1) exact construction schedule for the site (different procedures are necessary depending on season); (2) existing water source and expected impacts to the hydrologic conditions; (3) potential for providing supplemental water, should it become necessary; (4) estimated frog population size and types of use (breeding, dispersal, hibernation, etc.); (5) potential frog movement corridors in and out of the site (ditches, flooded or wet meadows, channels, nearby wetlands, etc.); and (6) whether the site is suitable for year-round, or only seasonal frog use (this involves making a judgment call and requires experience with spotted frogs of the upper Provo River).

Approximately six months prior to construction, the restoration design team should be made aware of any spotted frog sites within the impact area, especially if new spotted frog sites have been discovered. In addition, a briefing should be arranged to alert other the construction crew of any sensitive sites that are expected to be impacted. Unless told otherwise, construction crews may unintentionally use sensitive sites as sacrifice areas.

Sites that are not known spotted frog sites, but appear to have at least some suitable habitat, should be surveyed at least once (by a spotted frog biologist) during the frog season before allowing construction to proceed without spotted frog mitigation.

Frog Removal Plan

<u>Capture Methods:</u>

Visual Encounter Surveys

In areas directly impacted by construction, and in which spotted frog occur, all lifestages of frogs should be captured and removed. Visual Encounter Surveys are an effective method of locating frogs and egg masses during the breeding season (Crump and Scott 1994.). Egg masses are easily detected when walking the shorelines and other shallow sections of a pond. Also, adult frogs are fairly active in the breeding season and are often found near egg masses, so that many can be located during visual searches.

As a general rule, surveys conducted at various times of day are the single most effective method for removing frogs of all life stages during the active seasons (spring and fall). Removal surveys should begin about 2 - 3 weeks prior to construction (depending on the size of the impact area). However, this type of removal effort should be spread over a week, or more, to allow for recovery periods between surveys (see also schedule and personnel section, below). In some cases, ponds may need to be drained before or during construction. If this is the case, the pond should be subject to a final Visual Encounter Survey immediately after it is drained, in order to find and remove remaining frogs.

All mobile lifestages should be captured using a dip net that is deep enough so that frogs cannot jump out (< 1 ft deep) and in a shape that frogs can be handled without risk of accidental injury (e.g., due to bunched up netting). Eggs should be handled by hand and transported gently so as to avoid disintegration of the egg mass (for transport procedures, see below).

Drift Fencing

High-density spotted frog sites, or sites with poor survey conditions, should be encircled by drift fences to the extent feasible. The details of this procedure are described in Dodd and Scott (1994). It is recommended to use 3-ft silt fences with already-attached stakes, commonly utilized at construction sites to prevent silting of wetlands. The fence should be stretched between the impact and no-impact zones, with the 3" bottom flap of the fence toward the wetland. This flap needs to be sufficiently covered with soil to prevent frogs from squeezing underneath. If the fence has an open end (as opposed to making a full circle), traps may need to be set on the inside to prevent frogs from wandering around the fence.

Aquatic Funnel Traps

Trapping methods that have worked particularly well in Heber Valley involve aquatic funnel traps set up against drift fences or across channels (Richter 1995, J. Perkins *pers. comm.* 1997). Aquatic funnel traps (minnow traps) can be used in areas with standing water ≤ 1 ft deep. The traps need to be placed partially submerged in water or mud in order to minimize the chances that trapped frogs desiccate from exposure. Traps should be set every 10 m inside fence lines and, if necessary and feasible, throughout the fenced-in area, focusing on constrictions, inflow channels, and outflow channels of the wetland. Initially, traps should be visited 3-4 times a day to gauge frog and potential predator activity. In periods of low activity, traps should be checked twice a day. For this and all other trap methods, trapping should continue until capture rates drop and no frogs are trapped for several consecutive trapping sessions.

If minnow traps are stored in the field, the entrance tunnel needs to be covered with litter (or similar material) in order to prevent small mammals from getting trapped inside and dying. Generally, if minnow traps are set in a wetland, capture rates of other taxa are, with the exception of fish, low. Collecting is not permitted on this project, and all captured animals need to be released unharmed. We would suggest that all fish captured be identified and recorded on the data sheets and information be reported to DWR.

Hoop Nets

Hoop nets are generally used to capture fish in the water column. Based on a previous study (Perkins and Lentsch 1998), they also appear to be somewhat effective for trapping frogs in deep water. For frog removal, they can be placed in open water ≥ 1 ft deep and checked twice a day.

Pit-fall Traps

Generally, the use of pit-fall traps is not feasible in most wetlands, because high ground water levels prevent effective installation of deep buckets. In dry sites, however, pit-fall traps are generally the most feasible trapping method (Corn 1994, Dodd and Scott 1994) Most wetlands that have dry shores can also be trapped with minnow traps, and for the sake of reducing trap mortality, pit-fall traps should only be used if alternatives cannot be implemented. Trap mortality in pit-fall traps is very high for taxa other than frogs. Shrews and rodents, commonly found in this area, suffer particularly high mortality rates due to exposure and predator activity.

For pit-fall traps, drop containers of 3 to 6 liters made of sections of PVC pipe and fittings should be installed in a similar pattern as described for aquatic funnel traps (see above). Other materials that can be used as pit-fall traps include 5 gallon buckets, coffee cans, and similar medium-sized containers with lids. Trapping procedures described in Vogt and Hine (1982) and Corn (1994) should be followed as closely as possible. If time and budget allow, additional traps may be installed outside the fence line to determine movement attempts by frogs into the fenced-off area. In extreme conditions, such as heat or cold, traps should be closed with a lid.

Other Removal Methods

In some cases, frogs cannot be effectively removed by visual surveys, fencing, or trapping. Specifically, if only a small area within a large pond with high frog densities is impacted, frogs cannot realistically (and probably should not) be removed from the entire wetland. However, if unforseen circumstances necessitate this type of impact, frogs should be removed from the impact area during construction by (1) dragging seines (1/4" mesh size) in front of the immediate impact zone and (2) carefully excavating and relocating organic substrate from the pond bottom. Through this procedure, most, if not all, frogs are likely to be displaced from the impact zone.

If it is suspected that frogs are buried in the bottom sediments of a wetland, the frog-bearing sediments should be carefully deposited in the unimpacted section of the wetland or along the shoreline. The sediments should be spread thinly and deposited either inside or within a few meters of, the wetland, so that any emerging frogs can escape without desiccating. However, a supervisor with spotted frog expertise should be on site, when these activities occur.

<u>Frog Transport and Choice of Relocation Site:</u>

All lifestages of spotted frogs captured within construction impact zone need to be relocated. Frogs and egg masses are moved in a new 7.2 liter cooler, not previously used for any other purpose, about 1/3 filled with water. UTM coordinates or exact locations on aerial photography should be obtained for both capture site and release site for each frog (App. 3). Frogs should be held in transportation coolers for ≤ 30 minutes to minimize handling stress, and should generally be released in water no more than 5º C different from the location in which the frog was captured (Ross and Peterson 1998). Upon release, frogs are observed for several minutes to confirm recovery from handling. All field gear in direct touch with frogs and water should be treated with bleach solution or alcohol before moving from one major area to another in order to minimize the chance of spreading diseases (Wagner 1998). For the same reason, coolers used for relocations should be dedicated to a given area and only used within that area.

Potential relocation sites include (1) the nearest site with confirmed occurrence of the captured lifestage, (2) just outside the fence at the impact zone boundary, (3) the nearest site with confirmed occurrence of other lifestages, or (4) the nearest created wetland. A field person with fairly extensive spotted frog expertise should decide between these alternatives on a case-by-case basis. After selecting the best relocation site, DWR will make the final decision for each major relocation effort.

The release location within a site should be determined in the field based on the locations' apparent suitability for frogs. Whenever possible, egg masses should be placed in unoccupied oviposition sites of previous years in order to maximize the chances of egg survival. All frog and egg mass relocations should only be performed by personnel with experience in handling spotted frogs and other field methods used in amphibian studies.

Generally, frogs should be relocated starting as soon as possible after hibernation, or 2 - 4 weeks ahead of construction, depending on the size of the site and the number of personnel available. If a site is to be obliterated after the breeding season, all egg masses should be removed from the site before hatching, regardless of construction schedule. This will prevent having to deal with hundreds of dispersing tadpoles or young-of-the-year immediately before construction.

<u>Measuring, and Monitoring Relocated Frogs:</u>

All captured frogs should also be subject to measurement of SVL and weight to the nearest gram (using Pesola scales; see also data sheet in App. 3). In addition, data on the exact location of all frog encountered and other variables should be recorded (App. 3). Frog handling and measurements should be done by experienced personnel only, and according to Fellers et al. (1994), where applicable. Finally, relocation data, including exact capture and release locations, measurements, and all additional observations need to be entered on the standardized data form.

Mitigating for Indirect Impacts on Frog Sites

If a frog site is not directly affected by construction, but is located adjacent to a construction site, several indirect impacts may occur: (1) fluctuating water levels; (2) accidentally connecting the wetland to sites occupied by predaceous fish; (3) removing shoreline vegetation that may provide an important habitat component; and (4) adding or removing barriers for frog movement during and after construction.

Water Level Fluctuations

Fluctuations in water level are the most common indirect impact on wetlands during construction, particularly when construction occurs immediately adjacent to the site. Often, the ground water level is deliberately lowered before construction in order to make an area accessible to equipment. This is especially likely to happen when there are no dry surfaces that can be used for equipment access, such as dikes, berms, dirt roads, dry agricultural fields, etc.

Wetland level drops can have a variety of impacts on spotted frogs, depending on the season. During the breeding season (April-May), ***any*** drops should be avoided, unless egg masses have been removed from the site. Even a 2"-drop can leave all egg masses of a site stranded in desiccation territory.

During the tadpole season (May - August), a minimum amount of open water needs to be preserved at a breeding site in order to allow tadpoles to retreat into deeper sections of the wetland. Sudden and major drops in water level should also be avoided during that time, especially if fish are present in the site.

At other times of the year, when only semi-terrestrial lifestages of frogs are present, water level drops are less critical, as long as all wetland soils remain wetted and parts of the wetland saturated or flooded. Juvenile and adult frogs appear fairly flexible in habitat use, as long as they are not exposed to desiccation.

If water levels are expected to drop due to construction, several actions can be taken to provide supplemental water: (1) dikes or berms can be punctured to provide inflow from a higher-elevation water source; (2) channels can be excavated to provide inflow from ditches or streams; and (3) pumps can be installed and operated to pump water from lower elevations into the frog site. Which of these alternatives is selected depends on a given site's location in relation to potential water sources. Immediately after construction, water is usually released back into the site and the surrounding area, thereby resolving the problem of water level fluctuations. However, if a site is expected to dry up permanently as a result of the construction, actions should be taken to actively remove frogs from that site, or provide access to suitable habitat nearby.

Accidental Connection to Fish Habitat

Each frog site that will be impacted should be surveyed for potential access for predaceous fish. While native fish commonly co-occur with spotted frogs, adult sport fish should be perceived as a threat to spotted frogs (Ross and Peterson 1998). If adult sport fish are observed or suspected to be in nearby wetlands or channels, the design team and construction crew need to be alerted to the problem. Several actions can be taken to exclude sport fish from a frog site, including the installation of a French-drain connection, physically disconnecting potential sport fish access to frog sites through berms or dikes, and restoring habitat suitable primarily for native species.

Removing Shoreline Vegetation

Shoreline vegetation can provide important cover for spotted frogs in the form of root masses, woody debris, and leaning branches. Therefore, at least one row of shrubs or trees along the shoreline, if present, should be preserved when constructing around a spotted frog site. This is often done by default, since this vegetation occurs within the buffer zone that usually needs to be protected anyway.

Removing Potential Frog Movement Corridors

Some thought needs to be given to how the planned construction near a spotted frog site might influence frog movements during and after construction. The time of the year in which construction is scheduled plays a key role in decision making. Based on the available data (Ross and Peterson 1998), spotted frogs appear fairly sedentary most of the year, except during fall before hibernation retreat (mid-August through early October). At that time, especially juveniles and young-of-the-year are very inclined to migrate out of a breeding site, typically along inflow and outflow channels, but also across wet meadows, and even uplands when weather conditions are suitable. Adults should also be expected to move out at this time, particularly if no suitable hibernation habitat is present in the breeding site.

Ideally, construction is scheduled before or after this frog movement period. Meetings need to be held with the design team and DWR to explore the possibility of adjusting construction schedules accordingly. If construction falls outside this time period, blocking access to the impact zone by erecting drift fences and other barriers should be sufficient (possibly combined with a small trapping effort, see above). If construction falls into the frog movement period, the following conditions need to be evaluated: (1) Can movements out of the site be allowed in at least one direction, without the risk of frogs moving into the impact zone? (2) How quickly can the planned construction be completed, if done in a hurry and possibly under increased work effort (this obviously requires coordination with the construction crew) (3) If all other options fail, which methods of frog removal are feasible/desirable (this requires coordination and approval with DWR).

Adding Potential Frog Movement Corridors

Before constructing near a frog site, the longer-term consequences of all newly constructed landscape features need to be considered. Specifically, if new wetlands are created near an isolated existing frog site, the possibility of constructing a physical connection to that site should be pondered. Based on our observations, surface connections between sites allow easy access by spotted frogs, which are highly aquatic, to new sites. Connections may consist of open inflow or outflow channels, low topography that allows standing water between sites, or a French-drain connection (i.e., a short, subsurface connection between channels, constructed so as to prevent fish access).

The following factors should enter the decision making: (1) Would a connection allow access by predatory fish into a site with no fish (generally not good, especially for sport fish)? (2) Would a connection change the hydraulic and hydrologic conditions of the existing frog site (generally not good, unless changes are expected to be tolerated by frogs)? (3) How important does a connection seem for facilitating expansion of frogs into the new site (degree of isolation of the subpopulation, estimated population size, existing movement corridors, habitat availability, etc., all should enter this discussion)? Given that potential risks to the integrity of the existing frog site can be ruled out, surface connections to new sites appear to be extremely useful for promoting frog population expansion.

In contrast, if an existing frog site becomes surrounded by habitat unsuitable for frogs, it may be important to prevent a hydrologic (surface) connection. As a general rule, however, preventing hydrologic connections between any sites should be considered a last resort (and probably only be used for high-density frog sites).

Personnel and Schedules for Spotted Frog Mitigation Actions

For most spotted frog mitigation, one trained wildlife/restoration biologist is needed for planning and field work, as well as one full-time technician with experience in spotted frog handling, tagging, and assessing habitat suitability, for field work. For certain efforts, additional personnel may have to be recruited for a few days, for example to help with intensive visual encounter surveys, installing drift fences, or dragging seines. In addition, time needs to be allocated by the design team and construction crews to hold meetings with the biologist and DWR to complete some limited construction for spotted frog mitigation. Tables 1 and 2 provide a generalized task list for frog sites that may be directly impacted by construction and those that will be indirectly affected by construction.

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Table 1: Approximate schedule of activities for sites that are directly impacted (i.e., obliterated) by construction. Only typical activities are listed; additional mitigation may be needed in some sites (see text for details).

Scheduled Construction Time for the Site	Spotted Frog Mitigation Work	Schedule	Personnel and Time Required	Other Considerations

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April - May	1. Site-specific planning for spotted frog mitigation (assess available frog data, hydrology, potential frog barriers/corridors, for each site) 2. Remove egg masses and all other lifestages in the year previous to construction. Arrange meeting with regulatory agencies to determine relocation sites. 3. Encircle site with drift fences to prevent re-entry of frogs during and after removal. 4. Confirm that frogs are absent from the site. 5. Relocate soft substrates	Previous fall April - September (previous year) April (previous year, leave fenced until construction) April - May (immediately before and during construction) during construction	1 biologist, 2 - 5 days, depending on number of sites 1 biologist, 1 technician, 5 - 15 days (depending on frog densities and number of sites) throughout the season 2 - 4 workers (incl. supervising biologist), 1-3 days, depending on number of sites and logistics 1-2 workers (incl. supervising biologist), 1-5 days, depending on a variety of logistics, etc.) 1 biologist, 1 equipment operator, 1 day per site	direct impacts to frog sites during this time, i.e. directly after hibernation, should be avoided, if at all possible (the logistics are easier, if this time period can be used for frog removal)

June - August	1. Site-specific planning for spotted frog mitigation (assess available frog data, hydrology, potential frog barriers/corridors, for each site) 2. Remove egg masses and all other lifestages starting in breeding season. 3. Explore possibility of draining the site to discourage frogs from returning. 4. If the site cannot be dried up, either encircle with drift fences to prevent frog re-entry, or instead, continue to remove frogs until construction (in remote sites with few frogs)	March - April, or previous year early April - construction as soon as egg masses are removed early April	1 biologist, 2 - 5 days, depending on number of sites 1 biologist, 1 technician, 5 - 15 days (depending on frog densities and number of sites) throughout the season 1 meeting between biologist and design team; 1 day of construction (1 operator) 2 - 4 workers (incl. supervising biologist), 1-3 days, depending on number of sites and logistics	during irrigation season, sites can sometimes not be drained until immediately before construction - in that case, biologist should do final survey for frogs at low water (1-2 days, just before construction)

Late August - October	1. Besides typical site-specific planning (see above), the issue of seasonal habitat shift and dispersal of frogs needs to be addressed in detail for each site 2. Remove egg masses and all other lifestages starting in breeding season. 3. Explore possibility of draining the site to discourage frogs from returning. 4. If the site cannot be dried up, either encircle with drift fences to prevent frog re-entry, or instead, continue to remove frogs until construction (in remote sites with few frogs)	March - April, or previous year early April - construction as soon as egg masses are removed early April	1 biologist, 2 - 5 days, depending on number of sites 1 biologist, 1 technician, 5 - 15 days (depending on frog densities and number of sites) throughout the season 1 meeting between biologist and design team; 1 day of construction (1 operator) 2 - 4 workers (incl. supervising biologist), 1-3 days, depending on number of sites and logistics	
October - March	1. same four actions as above ("August - October") 2. Relocate soft substrates into protected areas of other wetlands, where they cannot desiccate.	see above during construction	see above 1 biologist, 1 equipment operator, 1 day per site	construction should be avoided, if the wetland or its substrates are frozen

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<u>Table 2:</u> Approximate schedule of activities for sites that will be indirectly impacted by construction. Only typical activities are listed; additional mitigation may be needed in some sites (see text for details).

Scheduled Construction Time	Spotted Frog Mitigation Work	Schedule	Personnel and Time Required	Other Considerations
April - May	1. Site-specific planning for spotted frog mitigation (assess available frog data, hydrology, potential fish access, potential frog barriers/corridors, for each site) 2. Ascertain that (breeding) site will undergo no water fluctuations during construction, or (non-breeding site) only slight fluctuations. 3. If water fluctuations are expected, plan to provide supplemental water, or remove egg masses as soon as possible. 4. Install drift fences, if necessary, to block access to the impact area. 5. Devise and carry out a weekly monitoring plan for each affected site in order to recognize and handle possible problems during construction.	Previous fall several weeks before construction several weeks before construction before construction before and during construction	1 biologist, 2 - 5 days, depending on number of sites 1 meeting between biologist and design team; 1 day of construction, if necessary (1 operator) 1-2 workers (incl. supervising biologist), 1-5 days, depending on decision made and number of sites 1-2 workers (incl. supervising biologist), 1-5 days 1 biologist, 1 day (planning) 1 technician, ½ hour per day during construction (monitoring)	
June - August	same five actions as above (“April - May”)	see above	see above	

Late August - October	1. Besides typical site-specific planning (see above), the issue of seasonal habitat shift and dispersal of frogs needs to be addressed in detail for each site 2. If frog movements out of the site cannot be allowed during construction, remove egg masses, possibly other lifestages, starting in breeding season. 3. If massive water fluctuations are expected, plan to provide supplemental water. 4. Install drift fences, if necessary, to block access to the impact area. 5. Instruct construction crew to report problems (e.g., water fluctuations); check on site every few days	March - April, or previous year early April - construction before construction before fall frog movements (i.e., early August, most years) during construction	1 biologist, 2 - 5 days, depending on number of sites 1 biologist, 1 technician, 5 - 15 days (depending on frog densities and number of sites) throughout the season 1 meeting between biologist and design team; 1 day of construction (1 operator) 2 - 4 workers (incl. supervising biologist), 1-3 days, depending on number of sites and logistics 1 meeting between biologist and construction crew, ½ hour every few days by technician	
October - March	1. Determine whether there is a chance that the site dries up as a result of construction. Prepare a plan to prevent this.	before construction	1 meeting between biologist and design team; possibly 1 (?) day of construction (1 operator)	best time to construct, because frogs are hibernating

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