

**Report No. 49110-AR**



## **Investigation Report**

**Argentina: Santa Fe Road  
Infrastructure Project  
(Loan No. 7429-AR)**

**July 2, 2009**

## About the Panel

The Inspection Panel was created in September 1993 by the Board of Executive Directors of the World Bank to serve as an independent mechanism to ensure accountability in Bank operations with respect to its policies and procedures. The Inspection Panel is an instrument for groups of two or more private citizens who believe that they or their interests have been or could be harmed by Bank-financed activities to present their concerns through a Request for Inspection. In short, the Panel provides a link between the Bank and the people who are likely to be affected by the projects it finances.

Members of the Panel are selected “*on the basis of their ability to deal thoroughly and fairly with the request brought to them, their integrity and their independence from the Bank’s Management, and their exposure to developmental issues and to living conditions in developing countries.*”<sup>1</sup> The three-member Panel is empowered, subject to Board approval, to investigate problems that are alleged to have arisen as a result of the Bank having failed to comply with its own operating policies and procedures.

### Processing Requests

After the Panel receives a Request for Inspection it is processed as follows:

- The Panel decides whether the Request is *prima facie* not barred from Panel consideration.
- The Panel registers the Request—a purely administrative procedure.
- The Panel sends the Request to Bank Management, which has 21 working days to respond to the allegations of the Requesters.
- The Panel then conducts a short 21 working-day assessment to determine the eligibility of the Requesters and the Request.
- If the Panel recommends an investigation, and the Board approves it, the Panel undertakes a full investigation, which is not time-bound.
- If the Panel does not recommend an investigation, the Board of Executive Directors may still instruct the Panel to conduct an investigation if warranted.
- Three days after the Board decides on whether or not an investigation should be carried out, the Panel’s Report (including the Request for Inspection and Management’s Response) is publicly available through the Panel’s website and Secretariat, the Bank’s Info Shop and the respective Bank Country Office.
- When the Panel completes an investigation, it sends its findings and conclusions on the matters alleged in the Request for Inspection to the Board as well as to Bank Management.
- The Bank Management then has six weeks to submit its recommendations to the Board on what actions the Bank would take in response to the Panel’s findings and conclusions.
- The Board then takes the final decision on what should be done based on the Panel’s findings and the Bank Management’s recommendations.
- Three days after the Board’s decision, the Panel’s Report and Management’s Recommendation are publicly available through the Panel’s website and Secretariat, the Bank’s Project website, the Bank’s Info Shop and the respective Bank Country Office.

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<sup>1</sup> IBRD Resolution No. 93-10; IDA Resolution No. 93-6.

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Map IBRD 34981

## **Abbreviations**

AADT	Annual Average Daily Traffic
BP	Bank Procedure
DNV	National Road Directorate
DPV	Provincial Road Directorate
EA	Environmental Assessment
ESMP	Environmental and Social Management Plan
IBRD	International Bank for Reconstruction and Development
IDA	International Development Association
IIRSA	Initiative for the Integration of Regional Infrastructure in South America
INTA	National Institute of Agricultural Technology
ISDS	Integrated Safeguards Data Sheet
MRM	Modified Rational Method
Mercosur	Southern Common Market
NPV	Net Present Value
OP	Operational Policy
OPRC	Operations Procurement Review Committee
PAD	Project Appraisal Document
PAP	Project Affected People
PID	Project Information Document
PIU	Project Implementation Unit
PSF	Province of Santa Fe
RAP	Resettlement Action Plan
ROW	Right of Way

## **Currency Unit**

(Exchange Rate Effective June 30, 2009)

Currency Unit	=	AR Peso
AR\$1.00	=	US\$0.26

## Executive Summary

The Inspection Panel (the “Panel”) presents its Investigation Report in response to a Request for Inspection dated September 7, 2007, related to the Argentina: Santa Fe Road Infrastructure Project (the “Project”). The Request was signed and submitted by Mr. Hector E. Jullier and Ms. Ana Rosa Tizianel, residents of Franck, Department of Las Colonias, Province of Santa Fe (PSF), Argentina, on behalf of themselves and ten other residents of the Project-affected area who also signed the Request (the “Requesters”). The Request also includes a letter addressed to the Panel dated August 31, 2007, clarifications, dated September 26, 2007, and additional documents.

The Requesters claim that they and other area residents are directly affected by the design and implementation of the Project and raise issues regarding the adequacy of the highway design, concerning in particular the water drainage aspects, the adequacy of the compensation for land taken under the Project and the amount of the land taking, and the adequacy of the communication and consultation process.

During the eligibility phase, and following discussions with the Requesters, Bank staff, Government officials and Project Implementation Unit (PIU) staff, the Panel noted that the investigation would take into account progress in the implementation of actions indicated in the Management Response and other actions being carried out at the time of the Response to address the concerns of the Requesters. Therefore, in its Eligibility Report, the Panel stated that its investigation would “*focus on issues raised in the Request that still remain pending, particularly issues related to route design and flood risks, as well as disclosure of information and consultation with project affected people on resettlement and environmental aspects.*” In the Panel’s judgment these were the most important concerns raised by the Requesters because they allegedly presented serious potential issues of non compliance with the Bank’s operational policies and procedures, with the risk of having a material adverse effect upon the Requesters.

**The Panel concludes that Bank Management and staff have made significant efforts to address the issues raised by the Requesters, to achieve compliance with Bank policies, and to engage in constructive and forthcoming dialogue with the affected people and with the Panel team. Overall, the Panel notes the positive way in which Management dealt with the complaint and strived for appropriate corrections. The Panel also notes, however, that the Project design was considerably more concerned with the impact of environmental conditions on the road rather than the impact of the road on the environment. Similarly the Panel found that, in spite of compliance with most consultation requirements, it was the timing of crucial communication activities that were at the root of the Request.**

The Panel observes that the present investigation and constructive response by Bank staff to issues raised in the Request for Inspection provide an example of how the Panel

process, in the context of a given project, may highlight important concerns of Project affected people and contribute to the solution of problems.

### **The Project**

The Project provides for upgrading 136 km of Road 19 between the cities of Santo Tomé in the Province of Santa Fe and San Francisco in the Province of Córdoba, including constructing a dual “carriageway” to convert Road 19 into a four lane highway (in Spanish, *Autovía*). The Bank finances the upgrading of 130km of Road 19 in the Province of Santa Fe, while works in the remaining 6km in the province of Córdoba will be funded by the National Road Directorate (Dirección Nacional de Vialidad; DNV). The Province of Santa Fe is to expropriate land to reach a right of way (ROW) of 120m. The Project is currently in the construction phase and, according to interviews with Bank Management, implementation is proceeding with no delays and including the implementation of the Resettlement Plan.

According to Management, the upgrading of Road 19 is the first phase of a two-phase program. Phase I is the Project financed by the Bank. Under Phase II, still in an early planning phase, Road 19 would eventually be transformed into a freeway (in Spanish, *Autopista*), with dual “carriageways” and limited access at toll booth points.

The total cost of the Project is about US\$173.1 million. The amount of the IBRD loan to the PSF is US\$126.7 million, while the Province of Santa Fe provides US\$46.4 million. The loan is guaranteed by the Argentine Republic. The Closing Date of the loan is June 30, 2012.

### **The Claims of the Requesters**

The Requesters list instances of non-compliance with Bank operational policies and procedures, and related harm and losses allegedly caused by failures and omissions by the World Bank. In their opinion, the Project will increase the risk of flooding in the area surrounding Road 19. The Requesters state that the conversion of Road 19 into a four lane highway with a new elevated carriageway, as envisaged in the Project, is incompatible with the area’s hydrological situation because the land is very flat and there is insufficient absorption and retention of rainwater, which will be aggravated by inadequate culverts in the Road for the passage of water. In their opinion, the road as designed will create a “dam effect” in case of heavy rain, which will cause harm to the surrounding fields and crops. In this context, the Requesters refer to the situation created by the “*flood disasters*” in December 2006 and March 2007.

The Requesters also claim that consultations and communications with affected people about the Project’s environmental and social impacts were not adequate, referring in particular to communications with landowners about each specific situation and the response to their concerns about the impacts of the Project on the hydrology situation of the area. They also raised issues of discrimination and intimidation during the land acquisition process.



This Request for Inspection is the third Request the Panel has received concerning this Project. Two Requests related to the same Project were received on August 28 and September 21, 2006, respectively, from residents of Chateaux Blanc, district of San Agustín, and of San Jerónimo del Sauce, in the Department of Las Colonias. Both localities are in the Project area (“2006 requests”). In the eligibility phase, the Panel concluded that, while the requesters were otherwise eligible to submit a Request for Inspection, the procedural criterion requiring that the requesters have brought the “*subject matter (...) to Management’s attention and that, in the requester’s view, management has failed to respond adequately demonstrating that it has followed or is taking steps to follow the Bank’s policies and procedures*” was not fully met. The Panel therefore determined that it could not make a recommendation on whether to investigate the subject matter of the Requests for Inspection at that time. The Panel nonetheless notes that the issues raised in the 2006 requests were eventually addressed to their satisfaction.

### **Management Response**

On November 20, 2007, the Panel received Management’s Response to the Request for Inspection. Management states that the major concerns of the Requesters, which are analyzed in the Management Response, were also discussed in a meeting with the Requesters on October 31, 2007, in Franck, Argentina.

With respect to the issue of flooding, Management states that the Requesters’ concerns are not well founded and the Requesters do not offer engineering or other evidence in support of their allegations. Management considers that from a safety and engineering point of view the proposed elevation is necessary to avoid that, during intense rain, water crosses the new improved Road 19, as has happened thus far with the present road. Management claims that the Project will not worsen the hydrological situation of the area, but, to the contrary, it will reduce the risk of flooding compared to the without-project conditions.

The engineering designs were also re-examined with respect to the risk of flooding, following a prompt Bank mission to the area after severe rain and flooding of Road 19 in March 2007. The Bank’s review and that of the Province of Santa Fe’s both confirmed the soundness of the designs and concluded that the Project will not increase the risk of flooding of the areas surrounding Road 19. Management further claims that the Province of Santa Fe had discussed the issue of flooding and drainage with the Requesters and in general with Project affected people in various public hearings.

With respect to the consultation process, Management states that project affected people, including the Requesters, have had numerous opportunities to express their concerns, including in public meetings and through an electronic mailbox and physical mailboxes in 15 communities. The Response notes that the Project design underwent a number of changes thanks to the consultations with affected peoples, whose concerns were key in the decision making process regarding for example alignments of bypasses, the location

of road crossings and definition of the types of restoration programs to carry out in urban areas.

Management argues that, under the Project, lands are acquired in accordance with the laws of the PSF and evidence shows that the Province has been conducting this process in an equitable way. Management states that it has closely supervised the land acquisition process and has seen no evidence of intimidating communication or discrimination towards the land owners. When asked by the Project team, project affected people did not report any lack of respect by members of the PIU. Management notes that even the Requesters, in their August 24, 2007 letter, thank the PIU for responding to their questions and concerns and offering explanations.

Management concludes by stating that the Bank has made every effort to apply policies and procedures and as a result it believes that the rights and interests of the Requesters have not been, nor are likely to be, harmed by a failure of the Bank to implement its policies and procedures. Management Response also includes a section specifically addressing the Bank's compliance with the policies and procedures, including in particular OP/BP 4.01(Environmental Assessment) and OP/BP 13.05 (Project Supervision).

### **The Investigation Process and Applicable Policies and Procedures**

This Report concludes the Panel's investigation in the matters alleged in the Request for Inspection. The Investigation was led by Panel's Chairperson Werner Kiene. The Panel Secretariat and expert consultants assisted the Panel in its investigation.

The Panel's investigation involved detailed research into Bank records related to the Project, meetings and teleconference with Bank Staff both in Washington DC and in Buenos Aires, Argentina, and a review of relevant documents. The Panel visited the Project area in October 2008 and met with the Requesters and other residents of the area around Road 19, with Bank Staff and national authorities in Buenos Aires, with local Government authorities in Santa Fe, and with officials of the Project Implementation Unit and local government agencies, including the Provincial Road Directorate and Ministry of Water Affairs. The Panel also met with environmental organizations in the Project area.

With respect to this Project, the Panel assessed whether the Bank complied with the following applicable operational policies and procedures:

OP/BP 4.01	Environmental Assessment
OP/BP 4.12	Involuntary Resettlement
OP/BP 13.05	Project Supervision
World Bank Policy on Disclosure of Information	

## **Hydrological Impacts**

### **Social, Economic and Environmental Context**

The Requesters' concerns about the Project's impacts on floods in the area have to be understood in the context of the local social, economic, and environmental characteristics, as well as the broader regional context of flooding in the river Parana basin.

The road upgrading Project is taking place within a complex and highly dynamic local rural development context in which agricultural and livestock production issues are closely intertwined with water and environmental management concerns. Experts agree that the long standing flood problem in the area is the result of a large constellation of factors. The Project cuts across a very flat area in which natural water drainage is inherently difficult and where changes in land use – from livestock and milk production to high value agricultural crops – have led to a slow deterioration of the soil, which cannot absorb rain properly. Furthermore, in attempting to overcome this problem, farmers have built small ad-hoc channels to drain excess water, which have in turn affected the patterns of runoff and water flow in the area. The Panel notes that the inter-connections among land use, water management and floods are relevant to this Project in that they affect the hydrology of the area and thus have a bearing on the design of the hydraulic components of the Project and the assessment of its impact on local flooding events.

Geographically, the Project area is located within the middle reaches of the Paraná River basin, which encompasses four countries (Argentina, Paraguay, Brazil and Bolivia) and has a total area of 1.5 million km<sup>2</sup>. Flood plains along the Paraná River are periodically inundated, usually during the high river flow period that begins in October/November and peaks between February and June/July. Evidence suggests that flooding risks have increased in the last three decades. The World Bank has played a major role in efforts to understand and control flooding problems in the Paraná River basin and has supported projects focused on improved management of the basin as well as structural and non-structural measures to mitigate floods and their effects. However, despite the importance of this larger regional context and the devastating impact that the floods in the river Paraná have had on development in the Province of Santa Fe, the Panel notes that floods in the area of the current Project are the direct result of rainfall in local watersheds rather than rises in the levels of the Paraná River.

### **Environmental Compliance**

#### **Environmental Categorization of the Project**

Screening is an essential component of the environmental assessment (EA) process because it determines *“the appropriate extent and type of EA”* applicable to a given

project. Screening assigns a project to one of three categories. “Category A”: a full EA is required. “Category B: environmental analysis is required but not a full EA. “Category C”: beyond screening, no further EA action is required. The environmental classification of a proposed project depends in general on the type, location, scale, sensitivity, magnitude and nature of the proposed project’s potential environmental impacts. According to Project documents, the Project was classified as Category B because the Project’s location was deemed to be a “*highly intervened area with little or nonexistent natural habitats or native vegetation*” under intensive agricultural production. It was judged that the Project’s potentially adverse environmental impacts on human populations or environmentally important areas were not such as to warrant a Category A assessment. **The Panel agrees with this judgment and finds that the Project was correctly categorized as B, in compliance with OP/BP 4.01.**

The Environmental and Social Management Plan (ESMP) is the instrument used in the Project to identify potential environmental impacts and social issues and mitigation measures. **While the ESMP undertaken for this Project has an important shortcoming in that it does not include a proper analysis of the Project’s potential hydrological impacts both upstream and downstream of Road 19 (as discussed below), this shortcoming does not seem to be the direct result of the “Category B” classification of the Project.**

### **Analysis of Project’s Potential Impacts on Flood Risks**

According to the Bank’s OP 4.01, “*EA evaluates a project’s potential environmental risk and impacts in its area of influence,*” which is defined as “*the area likely to be affected by the project, including all its ancillary aspects (...) The area of influence must include, for example, (a) the watershed within which the project is located.*”

The Panel reviewed the ESMP as well as the hydraulic and hydrologic analyses carried out as part of the Project’s Engineering Studies since these provided the basis for the assessment of the Project’s impact on local flooding events in the ESMP.

### **ESMP’s Analysis of Impact of the Project**

The ESMP defines the direct Project area of influence as the areas surrounding the road (both the existing one and the new carriageway to be built under the Project) as well as the areas associated with construction works. According to the ESMP, the indirect area of influence includes local areas that could be affected by the Project in different ways within a zone 10 km wide.

The Panel notes that the ESMP devotes attention to the analysis of the hydrologic and hydraulic aspects of the Project. Its principal conclusion is that the improved road will not worsen existing flood conditions. However, the Panel notes that the ESMP does not provide information to back up this conclusion, i.e. information on the changes in area flooded and duration under different rainfall scenarios.

The Panel also notes that the ESMP describes only the results obtained by the engineering firms (described below) and does not directly assess the hydrological impacts of the Project. In the Panel's view, engineering design and environmental assessment are two very different processes, and best practice would call for an environmental assessment to go beyond the results of the engineering analysis, gather updated information about existing conditions in the Project area and make a proper assessment of all the impacts on the Project in its area of influence. (This observation is not limited to the question of hydrological impacts. For example, during its investigation visit, the Panel learned that the Project design and mitigation measures did not fully consider the need to divert power, telephone and gas lines in one section of the Road because it allegedly relied on 1970s data that did not include more recent developments in the area.)

The Panel also examined the Requesters' concern that the Project could worsen the flooding problems of the areas downstream. The Panel finds that, contrary to OP 4.01, the ESMP did not analyze the Project's potential impact on flooding of the areas located downstream of the Road that should be reasonably regarded as within the area of influence of the Project. In particular, the ESMP does not provide information on the changes in area that would be flooded downstream under different rainfall scenarios and the amount of time that such areas would be flooded. The ESMP does not discuss potential mitigation measures to reduce such potential impacts.

**Although overall the ESMP contains an assessment of the social and bio-physical aspects of the Project, the Panel finds that it does not include a proper description and analysis of the Project's potential impacts on flooding risks upstream and downstream of Road 19. The Panel finds therefore that the ESMP is not fully in compliance with OP/BP 4.01.**

#### **Hydrologic and Hydraulic Analyses carried out as part of the Engineering Studies**

Hydrologic analyses are studies that determine the characteristics of the flood flows that would need to be handled by the road's hydraulic structures, i.e. - bridges and culverts. Hydraulic analyses are the studies that aimed to determine whether the road's hydraulic structures could properly evacuate these flood flows.

It is important to note that the Provincial Road Directorate (DPV), for contractual purposes, divided the work to be carried out in Road 19 in three sections:

Section I: National Road 11 – Provincial Road 6 (Access to San Carlos). Length: 29.421 km.

Section II: Provincial Road 6 (Access to San Carlos) – National Road 34. Length: 46.577 km.

Section III: National Road 34- border between the provinces of Santa Fe and Córdoba. Length: 54.000 km.

**The Panel found a lack of coherence among the basic criteria used in the hydrological studies for the three sections of the Road.** For example, the hydrological studies related to Sections II and III have explicitly taken into consideration land use changes and informal drainage channels built by the landowners to define properly watershed area and concentration time, but there is no evidence that informal channels were considered in the hydrologic evaluation of Section I. Different methodologies were also used to compute peak flows. In addition, climatic change effects were properly considered in the studies related to Section II, not in the other two sets of studies.

The Panel notes that, in all three studies, the hydraulic analysis considered an isolated drainage structure for each of the three sections and did not explicitly consider the interaction within the system components. In addition, one of the studies made the incorrect assumption that the culverts will operate under upstream control conditions, which led to an over-estimation of the amount of water that could flow through the culvert under flood conditions.

**The Panel finds that there are several technical shortcomings in the Project hydrological and hydraulic analyses. These shortcomings show a lack of rigor and robustness of the performed hydrological analysis and introduce an important degree of uncertainty in the results of the hydraulic analyses.**

Interviews with Project officials and Bank staff revealed that only when the different methodologies were explicitly pointed out by the Panel's expert, did those involved recognize the methodological problems of the studies. The Panel also found technical shortcomings in these studies. **The Panel finds that, during preparation phase, Management did not succeed in guiding appropriately the Borrower to ensure a rigorous analysis of potential environmental impacts as required under OP 4.01, paragraph 5.**

### **Additional Studies**

In March 2007, after an exceptional flood event that inundated a large portion of the Project area, Management promptly visited the area and requested a review of the technical studies by the engineering firms. According to Management, the review led to a judgment that the design and the hydrological analyses were sound. This review was also approved by the PSF's Ministry of Water Affairs. **The Panel notes, however, that this review employed the same technical and methodological approaches of the original studies, which, as pointed out earlier, suffered from methodological and technical shortcomings.**

Further studies were conducted after discussions between Management and PIU experts and the Panel's expert consultant during the Panel's visit to the Project area in October 2008. These studies aimed to "*provide additional elements that would clarify the hydrological impact*" of the Project and to overcome the shortcomings in the original studies with respect to the "*heterogeneity of the criteria employed by the engineering consulting firms*" by providing quantitative information on the actual area that would be

flooded in the event of specific rainfall events and the amount of time that such areas would be flooded. The studies were carried out for two watersheds that cross the Road with the potential for causing serious flooding along the Road – Los Cuatro Sauces and Cañada del Sauce and Arroyo del Sauce.

**These studies showed that, for rainfall events with return periods of 25 and 50 years, the “with Project” situation upstream of the Road was better than the “without Project” situation.** However, for an exceptional rainfall event like the one that occurred in March 2007, the time taken to evacuate all the flood waters from the flood area and therefore the duration of the floods is slightly higher under the “with project” scenario in comparison with the “without project” situation. The studies also showed that the positive effects of the Project upstream of the Road were more pronounced for rainfall events with shorter return periods – i.e. those that would occur more often.

### **Overall Conclusions on Analysis of Potential Impacts on Flood Risks**

The Panel finds that during Project preparation the necessary studies to demonstrate that, for any given flood event, the area flooded and the length of time that such area is flooded are no greater with the project than without it, were not adequately carried out. In the absence of these studies, it was not possible to make a categorical assertion on this matter as was done in Project documents, especially with respect to Section I of the road design.

However, the Panel acknowledges that additional studies were carried out after the March 2007 flood event and more recently after the Panel’s October 2008 visit to the Project area. **The Panel finds that, with respect to the assessment of potential impacts upstream of Road 19, the Project is now consistent with OP/BP 4.01.**

**The Panel also concludes that the additional studies carried out represent a positive effort to provide quantitative information about the upstream impacts in a form that can be easily understood by the affected parties. The Panel finds that this approach, which involved adjustments to the studies and the design in order to address existing and emerging issues, is consistent with Bank policy on Project Supervision.**

On the other hand, the Panel notes that an analysis of the Project’s impacts on flooding in the areas downstream of Road 19 was not carried out. **The Panel therefore finds that the ESMP and technical studies did not fully evaluate the Project’s “*potential environmental risks and impacts in its area of influence*” as required by OP/BP 4.01, and did not properly provide for mitigation measures of potential downstream hydrologic impacts.**

### **Consultation with Project Affected People**

The Requesters claim that consultations and communications with affected people about the Project’s environmental and social impacts were not adequate. In this regard, they

state that landowners were not provided with sufficient information to make an informed and satisfactory choice when they signed the compensation agreements. They add that their concerns about the Project's impact on the risk of flooding were summarily dismissed by Project authorities as "non expert" theories, while in turn sufficient information to support the statement that the Project will be beneficial to the area's hydrologic situation was not offered to affected people.

According to OP 4.01, meaningful consultations with people affected by Bank-financed projects and local NGOs must be initiated "as early as possible" during the EA process and the views of those consulted must be taken into account. Consultations occur also throughout project implementation. To ensure meaningful consultations people must receive relevant information about the project in a timely manner before consultations take place and in a language and form understandable and accessible to those consulted. OP 4.12 provides for meaningful consultation throughout various phases of the involuntary resettlement process to allow displaced persons to participate in planning and implementation of the resettlement program.

### **Consultations during the Project's Design Phase**

#### **Strategies for consultation and communication as set out in the ESMP and the RAP**

The ESMP includes a "*Communication and Community Participation Program*" targeting all those who could be in any way affected by the Project, including land and business owners on or near the road, the two school communities to be affected, those living near the contractors' operation centers and road-users. For the pre-construction, construction and operations stages, the program briefly describes some of the proposed communication methods to be used, which include public meetings in the main communities in the area and separate smaller meetings for those whose land or parts thereof would be expropriated; permanent information centers, and email access. According to the program, a Coordinator for Communication and Community Participation would be designated by the PIU with responsibility for ensuring interagency coordination in implementing the program.

The RAP in turn summarizes the ESMP communication program and identifies as target groups for communication and consultation those in the area of influence of the project who will continue to live in the area as well as those whose property will be expropriated.

#### **Consultations with the wider community in the design stage**

The PIU is responsible for implementing the Communication and Community Participation Program. According to the PAD, consultations began on April 10, 2006, and "*were carried out in all communities located near the ROW*" so as "*to receive comments and suggestions from the potentially affected communities.*" Initial meetings were held with the elected representatives of five communities (Frontera and Josefina, San Francisco, San Jerónimo del Sauce, Sa Pereira and Santo Tomé) in April 2006 to provide information on the Project.



Three rounds of public meetings were then conducted, in June and August 2006 and in July 2007. These meetings were held in communities along Road 19. While project records show that only a minority of participants in the first round of meetings were affected peoples, participation of people increased in the next two rounds. In August 2006, meetings were held to discuss the draft ESMP with those to be directly affected by the Project through land expropriation. Questions focused on the timetable and process for expropriations including the valuation of land and improvements. A number of the Requesters attended these meetings. Engineering plans were made available for public consultation and some individual questions were answered with direct reference to the plans. At the July 2007 meetings the brief minutes of those meetings indicate that concerns were mainly focused on the possible impact of the road project on flooding, after the March 2007 flood event.

**The Panel finds that affected people were given the opportunity to meet Project officials to express their concerns and to make suggestions for project design modifications, as required by Bank policy. The Panel also finds that many of the concerns related to the design of the Road were generally responded to and acted on. The Panel finds that this in compliance with OP 4.01.**

Nevertheless, the Panel would like to draw attention to the fears expressed by the Requesters that the proposed new road may have a negative impact on the hydrology of the area and their claim that their concerns were basically dismissed by Project authorities and Bank staff, until a Request for Inspection raising these issues was eventually submitted to the Panel. The Panel acknowledges that the Requesters were able to meet at various occasions with Project and local authorities and Bank staff, that they could express their worries and, as they state, were always treated with respect. The Panel observed, nonetheless, during discussions with Project technicians that several of the Requesters' concerns were sometimes dismissed because affected people were characterized as non-experts and not competent to discuss complex hydrological issues. **It is the opinion of the Panel that Bank staff did not sufficiently emphasize with the PIU the importance of communicating and consulting with affected people on flood risks and taking the Requesters' many years of field-based experience more seriously.**

### **Implementation of the Communication Program in the design stage**

As noted above considerable effort was made by the PIU to consult with affected communities, but this process fell short of what had been envisaged in the ESMP and RAP, which was not entirely implemented as planned. In particular, the Coordinator of Communication and Community Participation was not hired at the start of the project design stage. The Panel notes that the hiring of a Communication and Community Participation Coordinator at the start of the Project could have resulted in a stronger consultation effort. The extensive delay in hiring an individual with special skills to manage the program of communication and consultation meant that the critical communication and consultation components of the Project, in particular disclosure of

timely and complete information, were managed by engineering staff largely without experience or skills in community consultation. **The Panel notes that the delay in hiring the communication expert led to some delays in adequately implementing the communication and consultation programs and this may be the root of some of the complaints of the Requesters and other affected people.**

**The Panel notes, however, that Bank staff emphasized the need to hire a communication expert within the PIU on a number of occasions since Project preparation, although this eventually happened only in July 2008. The Panel finds this is in compliance with OP 13.05 on Project Supervision.**

### **Information and Consultation with Directly Affected Landowners**

The Requesters complain about inequities in the expropriation process, inadequate communication and information sharing with the landowners and discrimination and intimidation against some of them in the expropriation process. Management states that evidence shows that the PIU conducted the process in an equitable way and has seen no evidence of intimidating communication or discrimination towards the land owners.

Project records reveal that Bank staff gave priority to monitoring the expropriation process with respect to those affected people who had to relocate. The Panel met with two of the affected families and they confirmed that all the negotiations and outcomes had been to their satisfaction.

In the remaining cases, the Panel encountered differences of opinion among affected people with respect to communications and consultations related to the process of valuation and compensation and regarding the fairness of the cash compensation received. Some landowners complained to the Panel of being subject of discrimination in the process of assessing land values, while others informed the Panel that the expropriation process eventually concluded to their satisfaction.

The Panel observes that, specifically during its eligibility visit, it had constructive meetings with PIU staff and officials of the DPV and other agencies where some of the concerns of the affected people with respect to the land acquisition process were brought to the attention of those present at the meeting. From this meeting, it appeared to the Panel team that information that was provided to the Panel had not always been clearly and transparently made available to the affected people. For example, Management acknowledged that soil classification maps, which could clarify why different land values were assigned to contiguous landholdings, were not shared with affected landowners. This, in turn, generated perceptions of unfairness in the land acquisition process among some landowners. The Panel however did not find any evidence of intimidating notices having been sent to landowners.

**The Panel finds that information provided to the affected people during the land acquisition process was not always adequate. However, the Panel finds that, after initial difficulties, communications with landowners improved over time, especially**

**after the submission of the Request for Inspection. The Panel finds that with this improvement in the consultation process the Project is now in compliance with OP 4.12.**

According to the RAP, for properties with less than 40% land taking or with no “*mejora*”, an improvement in the land, only cadastral and land use data were gathered. The Panel could not find, as part of RAP preparation, a policy-consistent socio-economic analysis regarding specifically those affected people who would lose “only” a fraction of their land with no improvement in it, a position applying to many of the Requesters. Nor does it seem that, during Project preparation, consultations with these landowners sufficiently touched on the potential negative impacts of the partial expropriation.

On the other hand, Bank staff told the Panel during interviews that, while a detailed socio-economic study was not carried out, partial expropriation was compensated. In addition, landowners were offered expropriation of their entire land if the land would no longer be economically viable as a result of the partial expropriation. The Panel was also informed during its investigation visit that, although, assistance to restore socio-economic conditions existing prior to the Project was offered formally only to “*parcelas con mejoras afectadas*”, affected landowners not qualifying for the RAP’s socio-economic restoration program were offered measures to mitigate potential negative economic impacts of the expropriation, such as technical advice, information on productive projects carried out by the PSF, and assistance in coordinating actions with local business. The Panel learned that this assistance was offered to partially affected properties only recently, after the PIU was strengthened by incorporating social and communication experts.

**The lack of a complete socio-economic analysis covering all people affected by land acquisition is not consistent with OP 4.12. However, the Panel also finds that communication with landowners on this aspect improved significantly during Project implementation and that some measures to address the potential negative impacts of the partial taking were provided for. The Panel finds that although initially there was only partial compliance with OP 4.12, the situation improved as a result of Bank staff’s compliance with the policy on supervision (OP 13.05).**

### **Consultation during the Project implementation stage**

Project implementation started in August 2007. As noted above, the PIU finally hired a communication specialist in July 2008 as head of Communications and Community Participation Program to coordinate a communication plan to ensure that the public in affected communities was fully informed of construction plans and was given the opportunity to present complaints and have them acted on. To date, the plan has consisted of organizing public meetings, opening community information centers and providing information to the media and to the public through handouts.

Community information points (Puntos Comunitarios) were opened in September 2008 during the Project implementation stage, although they had been envisaged to operate

since the early preparation phase. The Panel heard some criticism about this service to date. One of the Requesters, for example, told the Panel he had attempted to use the information center in the community of San Jerónimo del Sauce but in twelve visits to the center had failed to find it open. The Panel notes that the delay in opening the information points until late 2008 made Project information and Project authorities less accessible to rural communities. The Panel Team observed also that affected people can request information at Works Manager offices in each section of the road.

The communication program called for the production of a brochure outlining the RAP and contact information of those responsible for its implementation. The Panel was not provided evidence that such a brochure was prepared. The Panel was provided however with a general information pamphlet (Boletín Informativo) about the Project, the second issue of which is dated March 2009.

With respect to water management issues, the Panel notes that at the time of the investigation visit (October 2008), the PIU had recently prepared and was distributing a brochure for affected people explaining the design of the road with respect to drainage and flood risk management, indicating which locations along the road are at a higher risk and what preventive and mitigating actions are going to be implemented. The Panel commends this initiative but also notes this level of communication with affected people earlier in project preparation could have helped address some of the Requesters and other people's concerns. **Up to this point, communication and consultations with affected people about the flooding management problems seem to have been limited to providing information about decisions already made, rather than listening and taking views of affected people into account.** The Panel notes that over time this attitude seems to have positively changed. One of the Requesters, for example, was asked to convey in writing his views about the hydrological issues of the project area in the context of updated hydrological studies carried out after the Panel's investigation visit to Santa Fe.

**In light of the above, the Panel finds that, while delays could and should have been avoided, the consultation and communication strategy during Project implementation is consistent with OP 4.01 and OP 4.12 and Bank staff is in compliance with requirements of Bank policy on Project Supervision.**

## **Chapter I: Introduction**

### **A. Events Leading to the Investigation**

1. On September 13, 2007, the Inspection Panel (the “Panel”) received a Request for Inspection, dated September 7, 2007, related to the Argentina: Santa Fe Road Infrastructure Project (the “Project”). The Request was signed and submitted by Mr. Hector E. Jullier and Ms. Ana Rosa Tizianel, residents of Franck, Department of Las Colonias, Province of Santa Fe (PSF), Argentina, on behalf of themselves and ten other residents of the Project-affected area who had also signed the Request (the “Requesters”). On September 26, 2007, the Requesters sent the Panel certain clarifications to the terms of the Request for Inspection. They also asked the Panel to treat a letter addressed to the Panel, dated August 31, 2007, and attached documents, as part of the Request for Inspection. The September 7 Request, the September 26 clarifications and the August 31 letter constitute the Request for Inspection (the “Request”).
2. The Panel registered the Request and notified the Board of Executive Directors and Management of the registration on October 19, 2007. Management submitted its Response to the Request for Inspection on November 20, 2007.
3. The Project provides for the upgrading of National Road 19<sup>2</sup> between the town of Santo Tomé in the Province of Santa Fe (PSF), Argentina, and the city of San Francisco on the border of the Province of Córdoba, Argentina, by widening this segment of the road to convert it into a dual carriageway. These works will also include aligning three sharp curves, and constructing four lane by-passes in San Jeronimo del Sauce and Sa Pereyra, ground-level interchanges at the intersections with rural and urban roads, and turn lanes and returns at intervals.<sup>3</sup>
4. The Requesters claim that they, and other area residents, are and will be directly affected by the design and implementation of the Project. The Request raises issues regarding the adequacy of the compensation for land taken under the Project, the amount of the land taking, the adequacy of the highway design concerning in particular the water drainage aspect, and alleged adverse environmental and economic impacts of the Project.
5. This Request for Inspection is the third Request the Panel received concerning this Project. This third Request raises issues very similar to those presented in the two previous requests.<sup>4</sup> On August 28, 2006, the Panel received a Request for Inspection (the “First Request”), dated August 20, 2006. The Request was

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<sup>2</sup> National Road 19 is hereinafter referred to as “Road 19.”

<sup>3</sup> Loan Agreement, Schedule 1.

<sup>4</sup> Four of the current Requesters were also among the persons that signed the earlier Requests that the Panel received in relation to the Project.

submitted by Mr. Hugo Mario Arriola-Klein and Dr. Nancy Beatriz Jullier, residents of Chateaux Blanc in San Agustín, Department of Las Colonias PSF, Argentina. They represented residents who live and work in the location known as Chateaux Blanc. On September 21, 2006, the Panel received a second Request for Inspection (the “Second Request”), dated September 21, 2006. This Request was submitted by Mr. Víctor Hugo Imhoff and Ms. María Alejandra Azzaroni, on their own behalf and on behalf of people living in San Jerónimo del Sauce, in the Department of Las Colonias, PSF, Argentina.

6. The Panel registered the first and second requests, respectively, on September 11 and September 21, 2006, and decided to process them jointly for reasons of economy and efficiency since they referred to the same Project and similar issues. The Panel assessed whether these two Requests were eligible and whether they warranted an investigation. It concluded that, while the requesters were otherwise eligible to submit a Request for Inspection, the procedural criterion requiring that the requesters have brought the “*subject matter (...) to Management’s attention and that, in the requester’s view, Management has failed to respond adequately demonstrating that it has followed or is taking steps to follow the Bank’s policies and procedures*” was not fully met. The Panel therefore determined that it could not make a recommendation on whether to investigate the subject matter of the Requests for Inspection at that time.<sup>5</sup>
7. However, the Panel wishes to note that following the submission of the Request for Inspection, the problems raised with the Panel were addressed to the satisfaction of the Requesters.<sup>6</sup>
8. The Requesters’ claims and Management Response are briefly summarized below and thoroughly addressed in chapters two and three of this Investigation Report.

## **B. The Project**

9. The Project aims at improving transport conditions, including road safety, of a segment of Road 19 along a strategic road corridor linking the PSF with regional and international markets. Project objectives also include identifying transport infrastructure and trade facilitation constraints, fostering territorial planning, assessing and managing environmental and social impacts resulting from the execution of large civil works, and monitoring and evaluating the execution of infrastructure investments.<sup>7</sup> These objectives are to be achieved through two components: civil works (Part 1), which provides for the upgrading of Road 19 between the city of Santo Tome in the PSF and the city of San Francisco in the Province of Córdoba, and institutional strengthening (Part 2). The Request for Inspection raises issues about Part 1 of the Project.

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<sup>5</sup> Inspection Panel Report and Recommendation, Request for Inspection, Argentina Santa Fe Road Infrastructure Project (Proposed), November 16, 2006, ¶64.

<sup>6</sup> For further details see below Section F, Chapter I.

<sup>7</sup> Loan Agreement, Schedule 1 (Project Description).

10. **Financing:** The total cost of the Project is about US\$173.1 million. The amount of the Bank loan to the PSF is US\$126.7 million, while the PSF provides US\$46.4 million. The loan is guaranteed by the Argentine Republic. The Closing Date of the loan is June 30, 2012.

11. According to Management, the Project is part of a broader infrastructure strategy aimed at, *inter alia*, making Santa Fe the most competitive province in Argentina.<sup>8</sup> As a national road, the improvement of Road 19 would fall under the jurisdiction of the national Government. However, limited fiscal resources have led the national Government to accept PSF's offer to provide financing for the Project.<sup>9</sup>



Picture 1: Current National Road 19

12. Management states that the upgrading of Road 19 is the first phase of a two-phase project. The first phase, financed by the World Bank, provides for improving a total of 136 km of Road 19 between the cities of Santo Tomé in the PSF and San Francisco in the province of Córdoba, and constructing a dual carriageway to convert Road 19 into a four lane highway (in Spanish, *Autovía*). Under the second phase, Road 19 would eventually be transformed into a freeway (in Spanish, *Autopista*), with dual carriageways and limited access at toll booth points.<sup>10</sup> The Bank finances the upgrading of 130km of Road 19, while works in the remaining 6km in the province of Córdoba will be funded by the National Road Directorate (DNV). The PSF is to expropriate land north of the existing road alignment to

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<sup>8</sup> Management Response to the Request for Inspection, November 20, 2007, ¶10.

<sup>9</sup> Management Response, 10.

<sup>10</sup> See Management Response, ¶19. During its visit to Santa Fe on March 10-17, 2008, the Panel was informed that the second phase of the Project referred to in the Management Response is still in an early planning stage.

reach a right of way (ROW) of 120m.<sup>11</sup> Under the Project design, the dual carriageway will run along the northern part of the 120m ROW.<sup>12</sup>

13. Part 2 of the Project aims at providing institutional support to the PSF and is composed of five subcomponents related to road safety, measurement of logistical costs in the PSF, strengthening of the strategic planning capacity, strengthening of the capacity of the Provincial Road Directorate (DPV) to enhance environmental and social management, and a capacity building program to incorporate monitoring and evaluation analysis in infrastructure projects.
14. As the road construction has started, Management recently informed the Panel that works are proceeding according to plans, including the implementation of the Resettlement plan.

### C. The Request

15. The Requesters believe that they “*will suffer damages as a consequence of failures or omissions by the World Bank*” in the design and supervision of the Project.<sup>13</sup> More specifically, they list several instances of non-compliance with Bank operational policies and procedures, and related harm and losses—for which they state they have evidence—including: “*discrimination*” and “*intimidating notices,*” “*inequity of the values,*” “*risk of flooding,*” “*lack of planning and delimitation of areas,*” and the “*possibility of future pollution and contamination.*”<sup>14</sup>
16. The Requesters state that the conversion of Road 19 into a four lane highway as envisaged in the Project is incompatible with the area’s hydrological situation. They believe that the “*loss of agronomic balance in the soil produces insufficient absorption and retention of rainwater...*” and claim that this will be aggravated by the spillways in the Road for the passage of water, which they say are inadequate. They add that the proposed “*new elevated carriageway will act as a contention and the culvert (north side) will operate as a collector of the ever increasing flows, which will cause problems of flooding in the neighboring fields and affect the population settlements...*”<sup>15</sup> In this context, the Requesters refer to the situation created by the “*flood disasters*” in December 2006 and March 2007.<sup>16</sup>

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<sup>11</sup> During the 1970s the national Government expropriated land along 54km of the north side of Road 19.

<sup>12</sup> The Panel was informed that the future freeway would require construction of an additional dual carriageway that would occupy the central ROW area, south of the carriageway to be built under the Bank-financed Project. The original Road 19 would then become a service road.

<sup>13</sup> Request p. 1.

<sup>14</sup> Request p. 1 and Clarifications to the terms of the Request for Inspection.

<sup>15</sup> Clarifications to the terms of the Request for Inspection.

<sup>16</sup> Clarifications to the terms of the Request for Inspection.



#### D. Management Response

17. On November 20, 2007, the Panel received Management's Response to the Request for Inspection. The main body of the Response addresses so-called Special Issues raised in the Request, and Annex I responds in detail to the Requesters' claims. Management states that the major concerns of the Requesters, which are analyzed in the Management Response, were also discussed in a meeting with the Requesters on October 31, 2007, in Franck, PSF, Argentina.
18. The Management Response first addresses the issue of flooding that, according to the Requesters, may result from the proposed elevation (0.80m) of the new carriageway to be constructed under the Project. Management states that the Requesters offer no engineering or other evidence in support of their allegation, while from a safety and engineering point of view the proposed elevation is necessary to avoid that, during intense rain, water crosses the new improved Road 19, as it has happened thus far with the present Road. Management refers to the "*professional rigor of the engineering designs*" prepared by "*well-known Argentine engineering firms*," and the "*stringent quality control process*" for these designs. Additionally, Management adopted the "*basic principle of road design standards*,"<sup>17</sup> reviewed and approved by both the Bank and the DPV. Because of this, the concerns of the Requesters, in Management's view, are not "*well founded*."
19. According to the Response, the Bank complied consistently with the policy on Environmental Assessment (OP/BP 4.01): all the studies and simulations conducted in Project preparation comply with sound standards. Therefore, it is Management's position that the Project will not worsen the hydrological situation of the area, but, to the contrary, it will reduce the risk of flooding compared to the without-project conditions. The engineering designs were also re-examined with respect to the risk of flooding, after severe rain and flooding of Road 19 occurred in March 2007. A Bank mission traveled to the area to check the Project designs, while the national authorities withheld the approval of these designs until the PSF again analyzed and re-examined them to ensure "*their robustness*."<sup>18</sup> Both the Bank's and the PSF's review confirmed the soundness of the designs and concluded that the Project will not increase the risk of flooding of the areas surrounding Road 19. Management further claims that the PSF has discussed the issue of flooding and drainage with the Requesters and in general with Project affected people in various public hearings. According to Management, in one of these meetings, one of the current Requesters even acknowledged that the area's hydrological issues pre-dated the Project and the flooding was not an issue that the Project had to solve.

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<sup>17</sup> Management Response, ¶20.

<sup>18</sup> Management Response, ¶23.

20. Management further states that in an area where the average size of the properties is 100 hectares, *“in fifty percent of the properties less than 4 hectares will be acquired to expand the ROW”*<sup>19</sup> under the Project. About 50 percent of the land required to upgrade Road 19 was acquired by the National Government in the 1970s; the remaining hectares that will be expropriated are located in 236 properties along the Road. In addition, 27 buildings will be displaced, 20 houses, 6 business and one school. The Response states that a RAP was prepared in accordance with OP/BP 4.12 on Involuntary Resettlement and it will be implemented before commencing the physical works. Management adds that the RAP includes an information and communication program. For landowners and households and businesses to be displaced, *“additional programs are included.”*<sup>20</sup> For those physically displaced, the program provides support for families and businesses *“to restore their socioeconomic conditions to the level that existed prior to displacement.”*<sup>21</sup>
21. Management states that it has closely supervised the land acquisition process. It adds that to date *“Management has not seen any evidence of intimidatory communication or discrimination”*<sup>22</sup> towards the land owners as alleged by the Requesters. When asked by the Project team, project affected people did not report any lack of respect by members of the PIU and, Management notes, even the Requesters, in their August 24, 2007 letter, thank the PIU for responding to their questions and concerns and offering explanations.
22. With respect to the consultation process, Management states that project affected people have had numerous opportunities to express their concerns, including in public meetings and through an electronic mailbox and physical mailboxes in 15 communities. Management notes that the Project design underwent a number of changes thanks to the consultations with affected peoples, whose concerns were key in the decision making process regarding for example road alignments of bypasses, the location of road crossings and definition of the types of restoration programs to carry out in urban areas. Management also states that the Requesters *“have participated actively in the consultation process and their concerns about access to productive land have been accommodated in the Project.”*<sup>23</sup> Management further states that the Project team participated actively in the consultations as well, participating in meetings, talking to landowners and communicating their concerns to the PIU.
23. Management’s Response also includes a section specifically addressing the Bank’s compliance with the policies and procedures that, in the Requesters’ view, the Bank has violated, as summarized in the following three paragraphs.

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<sup>19</sup> Management Response, ¶28.

<sup>20</sup> Management Response, ¶29.

<sup>21</sup> Management Response, Box at p. 11.

<sup>22</sup> Management Response, ¶35.

<sup>23</sup> Management Response, ¶38.

24. OP/BP 4.01 Environmental Assessment: Management states that the “*EA was an integral part of Project design.*” The Project was classified as Category B because the new road will run along the existing road alignment, land acquisition is only required to expand the ROW and few cases of displacements are taking place. The EA determined that “*no significant adverse sensitive, diverse or unprecedented environmental impacts are expected to occur.*”<sup>24</sup> In addition, the PSF has prepared the Environmental and Social Management Plan (ESMP), which identifies potential environmental impacts<sup>25</sup> and social issues along with appropriate mitigation measures, and reflects concerns of the project affected people and the local governments.
25. OP/BP 13.05 Project Supervision: Management states that the Project team has carried out various supervision missions and a number of smaller site visits to supervise the implementation of the RAP and the land acquisition and to take care of urgent issues such as the flooding following the intense rains in March 2007.
26. World Bank Policy on Disclosure of Information: Management states that the Project Information Document (PID), the Integrated Safeguard Data Sheet (ISDS), the ESMP, and the RAP are available in the Infoshop in Washington DC and in the Public Information Center (PIC) in Buenos Aires, Argentina. Local municipal offices may provide a summary of the ESMP, which together with the RAP is also available in Spanish. “*The PIU made available to the 2007 Requesters—after receiving a request from them—a copy of the ESMP and RAP.*”<sup>26</sup>
27. Management concludes by stating that the “*Bank has made every effort to apply its policies and procedures and to pursue concretely its mission statement in the context of the Santa Fe Road Infrastructure Project.*”<sup>27</sup> As a result, Management believes that the rights and interests of the Requesters have not been, nor are likely to be, harmed by a failure of the Bank to implement its policies and procedures.
28. On November 30, 2007, the Panel received a letter from the management of the PIU providing comments and additional information on the various issues raised in the Request for Inspection. The Panel acknowledged this letter and reiterated to the management of the PIU that the mandate of the Inspection Panel is to review the Bank’s compliance with its own policy and procedures in the preparation, appraisal and implementation of a Bank-financed project, upon receiving a Request for Inspection from Project affected people. While the Panel appreciated

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<sup>24</sup> Management Response, ¶42.

<sup>25</sup> In 2007 the PSF prepared a new Annex of the ESMP regarding “Restoration of Environmental Liabilities along the RN19 Corridor,” which concludes that “there are no illegal waste dumps along the ROW of National Road 19.” The Requesters allege that the quarries that will be used for the soil needed to elevate the new carriageway to 0.80m, may become a potential space for waste dumps.

<sup>26</sup> Management Response, ¶46.

<sup>27</sup> Management Response, ¶47.

information related to the Project, the Panel wishes to reiterate that it does not review the performance of the Borrower or the implementing agency.

#### **E. Eligibility of the Request**

29. Upon receiving a Request for Inspection, the Panel registers the Request and notifies the Board of Executive Directors and Management of the receipt of the Request and its Registration in the Panel's Register.<sup>28</sup> The Panel is then called to determine the eligibility of the Request and the Requesters, as set forth in the 1993 Resolution establishing the Panel and the 1999 Clarifications, and to recommend whether the issues represented in the Request warrant an investigation.
30. On December 21, 2007, the Panel requested the Board of Executive Directors to extend the deadline for submitting its Report and Recommendation on the eligibility of the Request, originally due on that same day. In its Memorandum to the Executive Directors, the Panel noted that the processing of the Request coincided with recent changes in the PSF Government, thereby leading to the appointment of new officials and possible staff changes in the Project Implementation Unit (PIU). In light of this, *"and after discussing the matter with the Requesters and the Executive Director representing Argentina"* the Inspection Panel took the view that *"the interests of all parties concerned with the Requesters would be better served if the Panel delays the issuance of its report on the eligibility of the Request and its recommendation..."* for *"about 90 days."*<sup>29</sup> The Board approved the Panel's recommendation on a non-objection basis on January 9, 2008.
31. The Panel Chairperson, Mr. Werner Kiene, together with Operations Officer Tatiana Tassoni and expert consultant Eduardo Abbott then visited Argentina in March 2008 (March 10-17, 2008). During the visit, the Panel team met with signatories of the Request and with other affected people in the area near Santa Fe. The Panel also met with national Government officials, with the Governor of the Province of Santa Fe and other provincial authorities, with officials of the Provincial Ministries and the PIU in Santa Fe, and with Bank staff in Buenos Aires.
32. The Panel determined that the Request fulfilled the eligibility requirements for inspection. The Panel recommended an investigation to the Board of Executive Directors because the Request and the Management Response contained conflicting assertions and interpretations of the issues, facts, compliance with Bank policies and procedures, and actual and potential harm.

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<sup>28</sup> See "About the Panel," page 2 of this Report, for details about the registration process.

<sup>29</sup> Memorandum to the Executive Directors and Alternates of the International Bank for Reconstruction and Development, Argentina: Santa Fe Road Infrastructure Project (Loan No. 7429-AR), Extension of Report Submission Date, INSP/R2007-0007, December 27, 2007.

33. On May 2, 2008, the Board approved the Panel's recommendation to conduct an investigation into the matters alleged in the Request for Inspection. The Request, Management Response, and the Panel's Report and Recommendation were made public shortly after the Board authorized the inspection sought by the Requesters.

## **F. Context: Events Preceding the Investigation**

34. As noted above, this is the third Request for Inspection the Panel has received concerning this Project. Some of the issues raised in the First and the Second Requests were addressed, while others lingered on, leading to the submission of the third Request for Inspection. The first two requests were submitted during the Project preparation phase.
35. In its Eligibility Report on the First and Second Requests, dated November 16, 2006, the Panel noted that *“one of the major concerns of the first Request seems now to have been addressed [...] Other concerns in the First Request and the concerns expressed in the Second Request had not yet been addressed as of the time of the Panel's visit, but the Panel notes that the Bank seems now in contact with the Second Requesters and other affected people.”*
36. The First Requesters were concerned about an overpass to be constructed at the intersection between National Road 19 and Provincial Road 6. Management stated in its Response, dated October 18, 2006, that the problem was resolved in that the overpass would be substituted with a ground level interchange.<sup>30</sup> The Second Request expressed, among other things, concerns about excessive expropriation of agricultural lands. In one particular case, the project design and the consequent expropriations would have caused, according to the Requesters, a diagonal division of a dairy farm, limiting the viability of the land and making it practically impossible to continue pursuing this activity.
37. In its eligibility report the Panel noted that one of the major concerns of the first Request was addressed: the overpass was to be substituted with ground level interchange. The Panel also indicated that some concerns expressed in the Second Request had not been addressed as of the time of the Panel's visit, but that the Bank was in contact with the second Requesters. The second Requesters eventually communicated to the Panel that a solution had been worked out to avoid dividing the dairy farm and would allow the continuation of the activities.
38. Issues related to the amount of land to be expropriated, the amount of compensation, and the adequacy of consultations of affected people however remained. The Panel received letters from the First and the Second Requesters expressing continuing concerns after the submission of the 2006 Eligibility Report. The Panel promptly forwarded these letters to Bank Management's attention.

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<sup>30</sup> Management Response, ¶19.

39. The design of the road has also been a particular concern of the Requesters, in particular with respect to the adequacy of the water drainage aspects, the eventual loss of access to the fields as the road is constructed, and others. The Panel notes that a fruitful dialogue between the Requesters and PIU have led to some changes in the road design, for example with respect to the access to roadside fields and provision of more frequent returns (every four km rather than six). It also notes that the road design was reviewed after severe flooding occurred in December 2006 and March 2007. According to Management, these reviews confirmed the soundness of the drainage systems, bridges and culverts design. In contrast, the Requesters worry the design is not adequate enough to ensure that the project does not worsen flooding of the fields and the nearby towns.



**Picture 2: Construction Works, at the time of the Panel's Investigation Visit**

## **G. The Investigation**

40. The purpose of the investigation was to establish whether the Bank complied with its own policies and procedures in the design, appraisal and implementation of the Project, and whether, if instances of non-compliance were found, they caused, or were likely to cause, harm to the Requesters and the people they represent. Acknowledging that some of the problems raised by the Requesters were being addressed by Bank Management, especially with respect to issues related to the land acquisition process, the Panel stated in its Eligibility Report that its investigation “*will focus on issues raised in the Request that still remain pending, particularly issues related to route design and flood risks, as well as disclosure of information and consultation with project affected people on resettlement and environmental aspects.*” In the Panel’s judgment, these were the most important concerns raised by the Requesters, because they presented serious issues of potential non compliance with the Bank’s operational policies and procedures, with the risk of having a material adverse effect upon the Requesters.

41. The Panel conducted a two-part investigation. Werner Kiene, Panel Chairperson led the investigation. The first part involved detailed research into Bank records related to the Project, interviews with Bank Staff both in Washington DC and in Buenos Aires, Argentina, and a review of relevant documents. The second part took the form of an in-country fact-finding visit. To assist in the investigation and provide expert advice, the Panel retained two consultants, who are recognized experts on the technical and social issues raised in the Request. The Panel was assisted in its investigation by Dr. Jose Rafael Cordova, hydrologist, and Dr. David Winder, social and community development expert.
42. Panel Chairperson Werner Kiene, Panel Member Roberto Lenton, Senior Operations Officer Tatiana Tassoni, and the expert consultants Jose Rafael Cordova and David Winder and Eduardo Abbott visited Argentina from September 30 to October 7, 2008. They met with the Requesters and other residents of the area around National Road 19, with Bank Staff and national authorities in Buenos Aires, with local Government authorities in Santa Fe, and with officials of the Project Implementation Unit and local government agencies, including the Provincial Road Directorate and Ministry of Water Affairs. The Panel also met with civil society organizations in the Project area.

## H. Timeline

43. The table below provides a timeline of the main events during Project preparation and execution, including the submission of the three Requests for Inspection that the Panel received in relation to the Project, main actions related to the Panel proceedings and other associated events.

<b>Project Preparation</b>	
Project concept review	February 22, 2006
PAD begins consultations with affected communities	April 20, 2006
Initial meetings held with five elected representatives of the area	April 2006
Special mailbox campaign for additional input started, " <i>Campaña Buzones</i> "	June 7, 2006
Public meetings in Frontera and Josefina, San Francisco and Santo Tomé	June 2006
Second round of public meetings to discuss a draft of the ESMP	August 2006
First Request received by Panel	August 28, 2006
Full ESMP made available on PSF website and letters sent to community presidents	September 2006
Seventeen meetings requested and held by project affected people with PIU staff in Santa Fe	September 2006-February 2007
Project Information Document (PID) available in Infoshop	September 9, 2006
Second Request received by Panel	September 21, 2006

Management Response to First and Second Request	October 18, 2006
Panel's Report and Recommendation (Eligibility)	November 16, 2006 (Requesters did not satisfy all eligibility requirements)
Board non objection to Panel's Report and Recommendation	December 5, 2006
Updated PID available in Infoshop	December 15, 2006
Completion of ESMP	December 2006
Begin Project Appraisal	December 18, 2006
Board of Executive Directors approval of Loan	February 13, 2007
Intense rains/Flooding of Project area	March 2007
Review and changes to Project hydraulic and hydrological design by engineering firms of Segment 1 and 2 of Road 19	March-July 2007
Bank Supervision Mission to assess technical design after flooding of April 2007	May 2007
Signing Legal Agreements	June 12, 2007
PIU organizes third round of community meetings, including information on lessons-learned from the March 2007 floods	July 24-26, 2007
<b>Project Implementation</b>	
Effectiveness of Loan Agreement	August 17, 2007
Third Request received by Panel	September 13, 2007
Panel registers Request	October 19, 2007
Meeting between Bank Management and Requesters	October 31, 2007
Management Response	November 20, 2007
Change in PSF Government	December 11, 2007
Inspection Panel Memorandum to the Board: Request for extension for eligibility determination (about 90 days)	December 21, 2007
Panel's eligibility visit to Project area	March 10-17, 2008
Panel's Eligibility Report and Recommendation	April 18, 2008 (Recommends investigation)
Board approval of Panel's recommendation	May 2, 2008
Communication specialist hired	July 2008
Panel's investigation visit to Project area	September 30 to October 7, 2008
Additional Hydrological Studies following Panel's October 2008 visit to Project area	October 2008- February 2009

## **I. Bank Operational Policies and Procedures Applicable to the Project**

44. With respect to this Project, the Panel assessed whether the Bank complied with the following applicable operational policies and procedures:

OP/BP 4.01  
OP/BP 4.12  
OP/BP 13.05

Environmental Assessment  
Involuntary Resettlement  
Project Supervision



## World Bank Policy on Disclosure of Information



**Picture 3: Construction works (October 2008)**

## Chapter II: Hydrological Impacts

### A. Background and Introduction

#### 1. Requesters' Concerns and Management Response

45. **Request.** The Requesters expressed their concerns about the hydrological impacts of the Project in their Request for Inspection and elaborated on them in various communications with the Panel and during the Panel's field visits to the Project area. The Requesters, who are mostly farmers owning parcels of land along Road 19 who know the area intimately and have long experience with living with the frequent floods in the area, note that the current Road allows excess water to go over it, thus dissipating flood waters relatively quickly. The Requesters are mainly worried that, in case of intense rains, the proposed new carriageway of Road 19, to be constructed under the Project at an elevation of 80cm on average (but more in some locations), will produce a dam effect, which will potentially increase the area flooded, the maximum flood levels in fields upstream of the road and the amount of time these fields are flooded.
46. The Requesters also expressed to the Panel their fear that, if bigger cross drainage structures are built under the Project, then more water will be channeled downstream of Road 19, potentially worsening the flooding problems of the downstream areas.
47. In describing the situation of the whole area around Road 19, the Requesters also note that the dynamics of the economic development of the region have produced changes in land uses, especially in crop pattern (from dairy farms to soybean). These changes have led farmers to build ad hoc drainage channels to evacuate excess rainfall from their farms more rapidly, which in turn have led to changes in the watershed response, decreasing its concentration time and changing the size of watershed contributing areas to the sites where the watercourses cross Road 19. While these changes pre-date the Project, the Requesters note that they affect the hydrology of the area and therefore need to be taken into account in the design of the Project and in the assessment of its impact on flooding in surrounding areas.
48. **Management Response.** Management Response, prepared in November 2007, stated that the concerns of the Requesters were not "*well founded.*" Management noted that the Requesters offered no engineering or other evidence in support of their allegation, while from a safety and engineering point of view the proposed elevation is necessary to avoid that, during intense rain, water crosses the new improved Road 19, as has happened thus far with the present Road. Management referred to the "*professional rigor of the engineering designs*" prepared by "*well-known Argentine engineering firms,*" and the "*stringent quality control process*" for these designs. The Response added that "*basic principle of road design*

*standards*”<sup>31</sup> were applied and were reviewed and approved by both the Bank and the DPV.”<sup>32</sup>

49. In Management’s opinion, the studies and simulations conducted during project preparation and the design reviews carried out after the big flood of March 2007 “are robust and lead to the conclusion that the upgrading of National Road 19 will not worsen the hydrological situation of the area surrounding National Road 19. On the contrary, all of the studies indicate that the risk of flooding in the surrounding area will be reduced compared to the case without the project.”<sup>33</sup> Management notes that, in addition, many of the existing drainage facilities under the present Road 19 (which will become one of the carriageways of the new National Road 19) do not have enough capacity for the resulting runoffs and therefore they are going to be enlarged to give them the same discharge capacity as the drainage channels that will be built for the new carriageway.
50. With respect to hydrological problems faced by productive lands, the Response indicates that it shares the concerns of the Requesters regarding the agronomic balance in the soil, the lack of absorption and retention of water and agrees that the informal canals built by landowners may damage productive lands. However, Management also notes that addressing this issue goes beyond the scope of the Project and any program in this sense is responsibility of the PSF.

## **2. Applicable Bank policy: OP 4.01 (Environmental Assessment)**

51. The Bank requires environmental assessment (EA) of its projects to help ensure that they are environmentally sound and sustainable and to improve decision making. An EA must evaluate potential environmental risks and impacts in the area of influence of the project, must examine project alternatives, identify inter alia ways to prevent, minimize, mitigate, or compensate for adverse environmental impacts and enhance positive impacts. Adverse impacts should be mitigated and managed throughout project implementation. Bank policy requires environmental assessment to be closely integrated with project economic, social, and technical analyses. This is to ensure that environmental considerations are given proper weight in project selection, siting, and design decisions. To avoid conflicts of interest, the Bank requires that environmental assessments are not conducted by the same consultants that are undertaking engineering design.

## **3. Structure of the Chapter**

52. The remainder of this chapter analyzes the requesters’ concerns about flood

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<sup>31</sup> Management Response, ¶20.

<sup>32</sup> See Management Response, Annex 1, ¶1.

<sup>33</sup> Management Response includes Annex 6, which contains an analysis aimed at showing that the proposed cross drainage structures, to be built in *Los Cuatro Sauces*’s crossing site, are sufficiently large to handle a 50 year flood event.

impacts and the Management response in the light of applicable bank policies. Part B contains a description of the regional and local context of the flood management concerns expressed by the requesters, while Part C analyzes Management's actions related to hydrologic impacts.

## **B. Social, Economic and Environmental Context**

53. The Requesters' concerns over the Project's impact on floods are best understood in the context of the local social, economic, and environmental characteristics of the area in which they live. The broader regional context of flooding in the river Parana basin is also relevant. This section therefore has two parts, the first dealing with the local context and the second with the regional context.

### **1. The local context: Agricultural development and land use changes in the area and their hydrologic impacts**

54. The road improvement project is taking place within a complex and highly dynamic rural development context in which agricultural and livestock production issues are closely intertwined with water and environmental management concerns. This section describes the agricultural development and land use changes experienced in the area and their impact on water management and floods.

55. The largely agricultural area that Road 19 traverses is the site of the first organized agricultural immigrant settlement in Argentina, which brought some 200 immigrant families from Switzerland, Germany, France, Italy, Belgium and Luxembourg to the area in the 1850s. Initially, agricultural development in the area was difficult as a result of high transport costs, international economic conditions, locust invasions, labor shortages and the fear of attack by indigenous populations. However, as these problems were overcome, the area became relatively prosperous -- the "new land" for thousands of immigrants, one well suited to agriculture and particularly to livestock and milk production, which became the focal point for many generations of families<sup>34</sup>.

56. Over time and especially over the last several decades, the area experienced many changes. Native forest began being replaced by trees to provide fruit and timber products. More land began to be used for crops and pastures. Grain sorghum, followed by soybean, began to be cultivated, and with it came the use of fertilizers and pesticides. All these changes led to a slow deterioration of organic matter in the soil, which began to lose porosity and capacity to retain water. At present, when rain falls in the area, the soil cannot absorb it properly, and depressions and lagoons get filled with excess water; but once the flood waters disappear, the soil

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<sup>34</sup> "Departamento Las Colonias - Provincia de Santa Fe", available at [http://www.dialogica.com.ar/uai/paginas/2007/11/departamento\\_las\\_colonias\\_prov.php](http://www.dialogica.com.ar/uai/paginas/2007/11/departamento_las_colonias_prov.php).

is again dry and water stressed<sup>35</sup>. A recent study<sup>36</sup> noted that flood risks in the region have increased since “soils used in agriculture suffer compaction processes and water erosion and as a result, surface runoff towards water receiving bodies is increased and accelerated, with less groundwater recharge, higher peak flows, and shorter concentration times”. (The same study, whose principal focus was on the impacts of climate change in the region, noted that rainfall events would be expected to increase in intensity and frequency in the next few years, further increasing flood risks.)

57. Another major development in recent years has been the shift from livestock to high value crop production. Since livestock production benefits from ponds and small bodies of water while crop production does not, farmers began un-coordinated efforts to drain the water away from their land, building small channels to drain excess water from their fields, often on to the properties of others -- each trying to find his or her solution. As an official of the Ministry of Water Affairs of the Province of Santa Fe<sup>37</sup> has put it, *“a small pond can be an asset in land used for livestock, but in agricultural land the same pond reduces the area available for productive purposes. But eliminating a pond from one farm simply transfers the problem to another farm, and so on. There is currently no overall integrated management of the basin as a whole, which is needed before the problems of individual farms can be resolved.”*

58. **Impacts on Water Management and Floods.** The changes in land use in the area to date have clearly had a strong impact on the patterns of runoff and water flow in the area, which have become more intense and rapid as a result of lower soil absorption rates and the construction of drainage canals. Importantly, these changes in land and water resources management have occurred in an area that is extremely flat and in which average rainfall exceeds average evapotranspiration. In this flood-prone area, the major water challenge is getting rid of excess water. All this has contributed to a serious degradation of the land<sup>38</sup>.

59. However, despite the important impact of land use changes and land degradation on water flows, the long-standing problem of floods in the area – and in other parts of the province of Santa Fe as a whole, which has suffered major rainfall-induced flooding events in recent years<sup>39</sup> – is the result of a larger constellation of

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<sup>35</sup> These problems have been outlined in a comprehensive analysis prepared by one of the requesters, Hector Jullier, in a document entitled “La Tierra se Muere” – “The Land is dying” (March 2007).

<sup>36</sup> “Estudios de Vulnerabilidad y Mitigación Frente al Cambio Climático en la Argentina: Estudio de Vulnerabilidad de los Recursos Hídricos del Litoral-Mesopotamia”, Facultad de Ingeniería y Ciencias Hídricas Universidad Nacional Del Litoral. Available at <[www.ambiente.gov.ar/cambio \\_ climático](http://www.ambiente.gov.ar/cambio_climatico)>.

<sup>37</sup> Ing. Gustavo Villa Uria, quoted in article by Lic. Exequiel Kay, “El río Salado, los mitos y realidades de las inundaciones en la provincia de Santa Fe”, El Santaferino, 5 Abril 2005.

<sup>38</sup> Note that the improvement of Road 19 may lead to further changes in land use, especially in the first section close to Santa Fe, where new housing developments attracted by better road transport facilities could be built. Such a change could further exacerbate flooding impacts.

<sup>39</sup> For example, in April 2003, the BBC reported that flooding in Santa Fe, the worst since 1573, killed 18 people and forced approximately 60,000 to evacuate their homes. Available at: <<http://news.bbc.co.uk/2/hi/americas/2999307.stm>>.

factors. Many experts agree that acute deforestation has been a major factor.<sup>40</sup> A 2005 article in *El Santafecino*<sup>41</sup> noted that flooding in the province of Santa Fe arises as the result of complex interactions among rainfall events, water control infrastructure (drainage canals, improved stream beds, larger or smaller culverts), on-farm water management, agricultural production technologies, forest preservation and other factors. The article emphasized that the construction of drainage canals, while partially solving waterlogging problems in some areas, has sometimes created other problems downstream. Although lack of water control infrastructure has worsened the situation, other factors such as the expansion of agriculture (especially soybean production) and the reduction of native forests have also been a factor. The Permanent Environment Commission of the City of Santa Fe (*Comisión Permanente de Medio Ambiente de la Municipalidad de Santa Fe*) has asserted that acute deforestation, coupled with inappropriate agricultural production practices (overgrazing, mono-culture and the indiscriminate use of agro-toxic products), have led to soil erosion and desertification that destroy the natural regulatory mechanisms inherent in river basins<sup>42</sup>.

60. In sum, the area in question presents what some environmental advocates have described as an “explosive cocktail” of problems – a very flat area that impedes natural drainage; changes in land use (from livestock and milk production to high value agricultural crops); changes in water flow and groundwater levels (drains built in a disorganized way, less water absorption in the soil, increasing groundwater tables); extreme rainfall and stream flow events; and long term climate change that seems to suggest long term increases in rainfall in the area.
61. **Institutional Issues.** At present, responsibility for flood management within the province rests largely with the Ministry of Water Affairs of the Province of Santa Fe. Much of the work of the Ministry of Water Affairs is undertaken via basin committees (*Comités de Cuencas*<sup>43</sup>), although these are organized on a municipal rather than a basin basis and do not seem to have a mandate to address actions taken by individual farmers.
62. Some of the broader challenges outlined above have been analyzed by the Environment Commission of Santa Fe<sup>44</sup>. In particular, the Commission has noted that engineering works must respect natural cycles: there is no use in building

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<sup>40</sup> According to a study by the University of Rosario, there has been a 31% loss between 2000 and 2005 in the “Cuña Boscosa Santafesina.”

<sup>41</sup> Lic. Exequiel Kay, “El río Salado, los mitos y realidades de las inundaciones en la provincial de Santa Fe”, *El Santafecino*, 5 Abril 2005.

<sup>42</sup> “Santa Fe y los Desmontes”, *Comisión Permanente de Medio Ambiente de la Municipalidad de Santa Fe*, 10 September 2008.

<sup>43</sup> There are at present 28 *Comités de Cuencas* in the province, covering some 4.7 million hectares of land and in which some 16,000 beneficiaries/contributing parties participate.

<sup>44</sup> “Santa Fe y los Desmontes”, *Comisión Permanente de Medio Ambiente de la Municipalidad de Santa Fe*, 10 September 2008. Available at <[http://www.cetsantafe.com.ar/noticias-preocupacion-por-el-correcto-uso-de-los-recursos-naturales-santa-fe-y-los-desmontes\\_49.html](http://www.cetsantafe.com.ar/noticias-preocupacion-por-el-correcto-uso-de-los-recursos-naturales-santa-fe-y-los-desmontes_49.html)>.

canals, embankments and bridges with larger spans, it says, if efforts are not made to retain water where it falls. Inadequate road infrastructure and stream canalization projects, the destruction of native forests and monoculture practices all serve to exacerbate the environmental impact of natural climatic events which, as a result of global warming, have changed in terms of frequency, magnitude and intensity. The Commission has stated that measures to reduce flooding impacts in cities like Santa Fe will not be sufficient if the deterioration of the land in those regions in which floods are generated continues to increase. It has called for an urgent and comprehensive plan of action that includes not only such measures as reforestation, grassland conservation and the promotion of agro-ecological production systems, but also a review of all water and road infrastructure projects implemented in the last two decades (canals, roads and bridges) and a correction of all their defects.

63. The Panel notes that the inter-connections among land use, water management and floods are relevant to this Project in that they affect the hydrology of the area and thus have a bearing on the design of the hydraulic components of the Project and the assessment of its impact on local flooding events.

## **2. The Regional Context: Flooding in the Parana River Basin**

64. The Project is taking place not only within the local rural development context described above but also within the larger context of the Paraná River basin. The hydrologic impacts of the Project should therefore be seen not only in the context of the agricultural development and land use changes experienced in the area but also in the broader regional context of the Paraná river basin as a whole, which encompasses four countries (Argentina, Paraguay, Brazil and Bolivia) and has a total area of 1.5 million km<sup>2</sup>. This section briefly describes the Paraná River basin and its relationship to water management and floods in the Project area.

65. Geographically, the Project area is located within the middle reaches of the Paraná River basin. Flood plains along the Paraná River are periodically inundated, usually during the high river flow period that begins in October/November and peaks between February and June/July<sup>45</sup>. Evidence suggests that flooding risks have increased in the last three decades, especially since the major floods of 1982/83, which affected an estimated 4.5 million residents of Argentina's "litoral", caused the evacuation of 177,000 persons and cost in 1993 US \$ 1.79 billion.

66. The World Bank has played a major role in efforts to understand and control flooding problems in the Paraná River basin. In 1993, the Bank carried out a study to review the apparent changes in the region's climate and their impact on

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<sup>45</sup> Anderson, Robert J., Nelson da Franca Ribeiro dos Santos, and Henry F. Diaz, "An Analysis of Flooding in the Paraná/Paraguay River Basin," *The World Bank: Latin America & the Caribbean Technical Department, Environmental Division* (September 1993): p. 5.

flooding<sup>46</sup>, which was followed by a subsequent independent report by Sir William Halcrow and Partners. The Bank supported the Flood Emergency Rehabilitation Project of the Government of Argentina<sup>47</sup>, which started in 1992, and the subsequent Flood Protection Project<sup>48</sup>, which focused on improved management of the basin as well as both structural and non-structural measures to mitigate floods and their effects. The latter measures were based on a “living-with-floods” strategy that encouraged “residents of rural areas and small communities to adapt to floods and even to capture their benefits when possible.”<sup>49</sup>

67. Despite the importance of this larger regional context and the devastating impact that the floods in the river Paraná have had on development in Santa Fé and other riparian provinces, the Panel notes that floods in the area of the current Project are the direct result of rainfall in local watersheds rather than rises in the levels of the Paraná river. Nevertheless when the level of the Paraná river rises, it can exacerbate local floods in tributary rivers and streams – such as those that traverse the Project -- by impeding the rapid evacuation of flood waters.



Picture 4: Panel team discussing flood risk issues with main Requester

### C. Analysis of Potential Impact on Flooding

68. This Part of the chapter analyzes Management’s actions related to the Project’s hydrologic impacts. It is divided into five sections. The first section deals with the environmental categorization of the project, which is described in the environmental and social assessment (ESMP) that was undertaken for the Project.

<sup>46</sup> An Analysis of Flooding in the Paraná/Paraguay River Basin, September 1993.

<sup>47</sup> For a summary of the Flood Emergency Rehabilitation Project see Staff Appraisal Report: Argentina Flood Protection Project, October 29, 1996, ¶2.23, p. 22. The project was Ln. 3521 – AR.

<sup>48</sup> The details of the Flood Protection Project can be found in the Staff Appraisal Report: Argentina Flood Protection Project, October 29, 1996.

<sup>49</sup> Staff Appraisal Report, Argentina Flood Protection Project, October 29, 1996, ¶2.50, p. 28.



The second section discusses the hydrologic analyses carried out in the engineering studies, which were used as a basis for the flood impact component of the environmental assessment. The third section reviews the way in which the ESMP analyzed flood impacts, while the fourth section reviews the further analyses and studies that were requested by Management. A fifth section summarizes the Panel's overall conclusions on the analysis of the Project's potential hydrologic impacts.

69. The environmental and social assessment (ESMP) that was undertaken for the Project is a stand-alone document of over 1000 pages; it comprises a 31 page synthesis of findings and 10 annexure dealing in detail with specific aspects of the project. The ESMP was complemented by three separate engineering studies that include analyses of flood-related aspects of the Project. These studies were carried out by three consulting firms responsible for the design of each of the three sections in which the road was divided for contractual, design and construction purposes.<sup>50</sup> After the exceptional floods of March 2007, the three consulting firms reviewed their engineering, hydrological and hydraulic studies that had been carried out in parallel with the environmental assessment.<sup>51</sup> A further formal review of these studies was conducted in late 2008 following the Panel's October 2008 investigation visit to the Project area. A chronology of these events is provided in Chapter I.

70. The Panel reviewed these documents and the Bank's actions from three points of view: whether the Category B Classification of the Project was appropriate; whether the assessment and supplementary technical studies were carried out in accordance with Bank policy (OP/BP 4.01), including the impact of the road improvement project on flooding in the region, both upstream and downstream of the Road and whether the Bank exercised appropriate supervision of these studies. The Panel's analysis is described in the sections below.

## 1. Environmental Categorization of the Project

71. Screening is an essential component of the environmental assessment (EA) process. It determines *“the appropriate extent and type of EA”* applicable to a

<sup>50</sup> See paragraphs below for a more detail description of the three sections. CONSULBAIRES Ingenieros Consultores. 2007. *Capítulo 5 Obras Básicas*. Proyecto Ejecutivo. Autovía Ruta Nacional N° 19. Tramo: Ruta Nacional N° 11 – Ruta Nacional N° 158. Subtramo 2: Ruta Prov. N° 6 (Acceso a San Carlos) – Ruta Nacional N° 34. Provincia de Santa Fe, Argentina; INCOCIV Consultora. 2007. *Capítulo 5. Obras Básicas*. Estudio de Ingeniería y Evaluación Económica para la obra: Ruta Nacional N° 19, Tramo: R.N. N° 34 – R.N. N° 158. Dirección Provincial de Vialidad. Provincia de Santa Fe, Argentina; and Ing. Cornero Consultora S.A. 2007. *Capítulo 5. Obras Básicas*. Ruta Nac. N° 19. Tramo: Ruta Nac. N° 11 – Ruta Prov. N° 16. Provincia de Santa Fe, Argentina.

<sup>51</sup> “Approval of Hydrological Studies”, which includes the Estudio Hidrológico e Hidráulico Complementario de la Ruta Nacional N2 19 tramo: Ruta Nac. N° 11 — Ruta Prov. N2 6; the INFORME TECNICO: Ref.: Proyecto Ejecutivo Autovia Ruta Nacional N°19 Tramo: RNN°11 — RNN°158, Sección 2: RPN°6 (Km 29) — RNN°34 (Km 75) Provincia de Santa Fe. Estudios Hidrológicos e Hidráulicos, and the Nota de Aprobación del Ministerio de Asuntos Hídricos de Santa Fe.

given project.<sup>52</sup> Screening assigns a project to one of three categories. “Category A”: a full EA is required. “Category B”: environmental analysis is required but not a full EA. “Category C”: beyond screening, no further EA action is required. The classification of the proposed project depends in general on the type, location, scale, sensitivity, magnitude and nature of the proposed project’s potential environmental impacts.

72. Projects are categorized as A when their likely adverse environmental impacts are unprecedented, diverse or sensitive, that is, impacts that may be irreversible. Projects may be classified as category B if it is judged that their potentially adverse environmental impacts on human populations or environmentally important areas—including wetlands— do not warrant a category A, as they are less adverse, site-specific, and few of them, if any, are irreversible. Nevertheless, even in a Category B project, the environmental assessment is required to examine the project’s potential environmental impacts and recommend any measures needed to mitigate or compensate for adverse impacts and improve environmental performance. The findings and results of a category B environmental assessment must be described in the project documentation (Project Appraisal Document and Project Information Document). However, when the screening process determines, or national legislation requires, that any of the environmental issues identified warrant special attention, the findings and results of a category B environmental assessment may also be set out in a separate report.
73. According to Project documents, the Project was classified as Category B because the Project’s location was deemed to be a *“highly intervened area with little or nonexistent natural habitats or native vegetation”* under intensive agricultural production. It was judged that the Project’s potentially adverse environmental impacts on human populations or environmentally important areas were not such as to warrant a category A investigation. It was also considered that most impacts would be *“localized and associated with the current and future right-of-way”* and that induced development issues would be expected to be minimal.<sup>53</sup> The PAD further noted that *“no significant, region-wide or precedent-setting impacts are envisioned.”*
74. The Panel notes that the findings and results of the Project’s Category B environmental assessment were set out in a separate report – the ESMP mentioned above. The Panel reviewed whether for this particular Project the “Category B” assignment complies with the Bank policy on environmental assessment, taking into account the Bank’s guidelines for environmental screening and classification.<sup>54</sup> It notes that the Project in question calls for an elevation of the road that could have hydrologic impacts that extend beyond the current and future right-of-way. Nevertheless, the Panel agrees with Management that the Project’s

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<sup>52</sup> OP 4.01, ¶ 8.

<sup>53</sup> PID, Section 4 (Safeguards policies that might apply). PAD, p. 24.

<sup>54</sup> World Bank, Guidelines for Environmental Screening and Classification, February 2007.

potentially adverse environmental impacts on human populations or environmentally important areas were not such as to warrant a category A investigation. **The Panel agrees with this judgment and finds that the Project was correctly categorized as B, in compliance with OP/BP 4.01.**

75. The Panel also notes that the studies in the ESMP are of the scope and depth that would be expected of a “Category A” environmental assessment and have been integrated into and influenced project design so as to reduce both the social and bio-physical impacts of the road. **While the ESMP undertaken for this Project has an important shortcoming in that it does not include a proper analysis of the Project’s potential hydrological impacts both upstream and downstream of Road 19 (as discussed below), this shortcoming does not seem to be the direct result of the “Category B” classification of the Project.**

## **2. ESMP’s Analysis of the Impact of the Project on Flooding**

76. The Panel has reviewed the ESMP and related Project documents (in particular the engineering and hydrological studies as described above) to determine whether the impact of the Project on flooding in the area, both upstream and downstream of the road, was properly assessed in accordance with OP/BP 4.01.
77. The Panel notes that the Terms of Reference (TOR) for the Environmental Assessment (2006) required that all the possible environmental impacts be identified, described and assessed, analyzing the nature, importance, magnitude, intensity and temporal dimensions of these impacts. The TOR also required that the environmental impacts should be described to the extent possible in maps indicating the location of the affected areas and other characteristics, giving emphasis to the assessment of impacts resulting from the Project’s interference of the natural drainage systems and its possible dam effect<sup>55</sup>.
78. The PAD indicates that during Project design “*special attention*” was paid to the “*management of hydraulic and hydrological interactions along the right of way*” and concludes that “*All in all, the road will not exacerbate existing hydrological conditions and floods in its area of influence but rather improve existing conditions.*”<sup>56</sup>
79. The ESMP defines the direct and indirect area of influence of the Project (“area de afectación”). The direct area of influence consists of the areas surrounding the road - both the existing road and the new carriageway, and the areas where the

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<sup>55</sup> Section 2.1., e) of these terms of reference on page 9 reads as follows: “Se deberá identificar, describir y valorar los posibles impactos ambientales directos e indirectos del proyecto tanto durante las fases de construcción y operación. Esta parte del estudio implica el análisis de la naturaleza, importancia, magnitud, intensidad y temporalidad de los impactos. La descripción de los impactos deberá hacerse, en lo posible, en forma esquemática/gráfica, ubicándolos en mapas en escala 1:10.000 o aproximada, indicando la localización de los impactos de mayor relevancia, su extensión, superficies afectadas, y otras características. Debe darse énfasis a los impactos debidos a: Interferencia con el sistema de drenaje natural existente; posible efecto barrera de la carretera;...”

<sup>56</sup> PAD, p. 55.

returns and roundabouts will be - as well as the areas associated with the construction works. The indirect area of influence includes local areas that could be affected by the Project in different ways; “*taking into account that the Project does not have a regional impact of significance,*” the ESMP considered a zone 10 km wide.<sup>57</sup>

80. The Panel notes that the social and environmental assessment devotes attention to the analysis of the hydrologic and hydraulic aspects of the Project. Its principal conclusion is that the structural measures planned to ensure that the culverts and bridges will evacuate the design floodwaters and thus ensure that the road itself does not flood will in themselves guarantee that the impact of the project on the environment will be minimal – i.e. that the improved road will not worsen existing flood conditions. However, the Panel notes that the ESMP does not provide information to back up this conclusion, i.e. information on the changes in area flooded and duration with and without the Project under different rainfall scenarios.
81. The Panel notes that the ESMP describes only the results obtained by the engineering firms and does not directly assess the hydrological impacts of the Project. In the Panel’s view, engineering design and environmental assessment are two very different processes and best practice calls for an environmental assessment to go beyond the results of the engineering analysis, gather updated information about existing conditions in the Project area and make a direct assessment of all the impacts of the Project in its area of influence. (This observation is not limited to the question of hydrological impacts. For example, during its investigation visit, the Panel learned that the Project design and mitigation measures did not fully consider the need to divert power, telephone and gas lines in one section of the Road because it allegedly relied on 1970s data that did not include more recent developments in the area.)
82. With respect to the hydrological impacts, the difference between the kinds of studies that would have been required for a proper environmental assessment of flood risks and the engineering design studies carried out under this Project are explained in more detail in Annex B.
83. **The Panel finds that the necessary studies to demonstrate that for any given flood event, the area flooded and the length of time that such area is flooded is no greater with the project than without it, were not carried out in Project preparation. In the absence of these studies, it is not possible to make a categorical assertion on this matter as is done in Project documents.**
84. **Although overall the ESMP contains an assessment of the social and bio-physical aspects of the project, the Panel finds that it does not include a proper description and analysis of the Project’s potential impacts on flooding**

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<sup>57</sup> ESMP, Chapter 5, p. 1 (Condiciones de Base).

**risks upstream and downstream of Road 19 and therefore is not fully in compliance with OP/BP 4.01.**

85. The Panel also examined the Requesters' concern that the Project could worsen the flooding problems of the areas downstream, taking into account that the greater volumes of floodwaters evacuated by the larger culverts and bridges incorporated into the Project design could, in the absence of proper downstream drainage systems, increase the extent and duration of downstream floods.
86. According to the Bank's OP 4.01, "*EA evaluates a project's potential environmental risk and impacts in its area of influence; examines project alternatives; identifies ways of improving project selection, site choice, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and includes the process of mitigating and managing adverse environmental impacts throughout project implementation. ..*" Additionally, in Annex A of OP 4.01, the project area of influence is defined as "*The area likely to be affected by the project, including all its ancillary aspects ... The area of influence must include, for example, (a) the watershed within which the project is located; ...*"
87. **The Panel finds that, contrary to OP 4.01, the ESMP did not analyze the Project's potential impact on flooding of the areas located downstream of the Road that should be reasonably regarded as within the area of influence of the Project.** In particular, the ESMP does not provide detailed information on the changes in the area that would be flooded downstream with and without the project under different rainfall scenarios, and changes in the amount of time that such areas would be flooded. In addition, the ESMP does not discuss potential mitigation measures to reduce such potential impacts. The Panel acknowledges the point in the Management Response that "*[t]he establishment of a program that supports the absorption of residual waters from the entire area should be pursued by the PSF but it is an activity that clearly goes beyond the scope of the Project.*" The Panel also notes that Part II of the Project (Institutional Strengthening) requires, as part of strengthening the environmental capacity of the DPV, "*the carrying out of a strategic environmental assessment (which shall focus on poverty and the regional hydrological patterns and floods, wetland conservation, land use, and rural development) for purposes of assessing the linkages between the provincial road network and regional development scenarios, including the acquisition and utilization of goods and the provision of training required thereof.*"
88. **The Panel finds nonetheless that, to achieve compliance with OP 4.01, the Project's Environmental Impact Assessment should have considered potential downstream flooding impacts in its analysis and should have proposed some environmental mitigating measures if needed,** within a broader framework for the integrated management of floods in the area.



Picture 5: Construction works (October 2008)

### 3. Hydrologic and Hydraulic Analyses carried out as part of the Engineering Studies

89. To address the issue raised by the Requesters relating to the impact of the Project on local flooding conditions and which fall within the scope of the Project's EA, the Panel reviewed the hydraulic and hydrologic analyses<sup>58</sup> carried out as part of the Project's Engineering Studies since these provided the basis for the assessment of the Project's impact on local flooding events in the EA.

90. For purposes of this analysis, it is important to note that the Provincial Road Directorate (DPV), for contractual purposes, has divided the National Road 19 in three sections:

- Section I: National Road 11 – Provincial Road 6 (Access to San Carlos). Length: 29.421 km.
- Section II: Provincial Road 6 (Access to San Carlos) – National Road 34. Length: 46.577 km.
- Section III: National Road 34-Border with the provinces of Santa Fe and Córdoba. Length: 54.000 km.

91. The Panel examined the hydrologic and hydraulic analyses carried out for these three sections, with special attention to determining whether these analyses properly reflected local realities. In doing so, the Panel took into account one of

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<sup>58</sup> Hydrologic analyses are studies that determine the characteristics of the flood flows that would need to be handled by the road's hydraulic structures, i.e. - bridges and culverts. Hydraulic analyses are the studies that aimed to determine whether the road's hydraulic structures could properly evacuate these flood flows.

the main Requesters' concerns -- that the dynamics of the economic development of the region have produced changes in land uses, especially in crop patterns, which have in turn induced the construction of drainage channels to drain excess water away from individual farmers' fields, leading to:

- Changes in watershed response, decreasing its concentration time, which implies an increase of the maximum flood area<sup>59</sup>.
- Changes in the size of watershed contributing areas to the site where the watercourses cross the NR 19 alignment, which is one of the most important catchment parameters needed to estimate the flood hydrograph.<sup>60</sup>

92. The Panel notes that the proper definitions of watershed area and concentration time are of paramount importance to estimate the flood hydrograph. Therefore, in each road section's hydrological studies, the changes in land use, channel dredging, new channel construction etc must be taken into account.

93. The Panel's examination of the hydrologic and hydraulic analyses of these three sections thus focused on three questions. First, were the hydrologic analyses technically sound and did they properly take into account the changes in land use and existence of informal drainage channels in the area, which local residents know have drastically changed runoff patterns and augmented flood flows at the point where they intersect the road? Second, was the analysis of rainfall patterns in the area technically sound and did it properly take into account current and projected changes in these patterns? And third, were the hydraulic analyses technically sound and did they properly take into account the actual conditions under which these structures would operate in practice, taking into account the inadequacies of drainage downstream of the road and thus the likelihood that flow through these structures would be governed by downstream conditions?

94. The Panel's analysis of these issues is described in detail in Annex 1. The Panel's key conclusions are summarized in the following paragraphs.

95. **Hydrological Studies.** The Panel finds that the hydrological studies related to Sections II and III have explicitly taken into consideration land use changes and construction of informal channels built by the landowners to properly define watershed area and concentration time. However, with respect to Section I, the Panel notes that very important hydrologic parameters, such as watershed size and time of concentration, are still uncertain and there is no evidence that informal channels were considered in the hydrologic evaluation of Section I. In addition, different methodologies were used to compute peak flows. The Panel observes that, while climatic change effects were properly considered in the studies related to Section II, the other studies did not do so. Furthermore, none of the

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<sup>59</sup> See Glossary in Annex C.

<sup>60</sup> A hydrograph is a plot of the flood flows of the watercourse as a function of time.

hydrological studies performed and carried out in the three Road 19 sections considered, at least in an explicit way, the spatial variability of the rainfall events that generate the flood flows.

96. **Hydraulic Analyses.** The Panel notes that, in all three studies, the hydraulic analysis considered an isolated cross drainage structure and did not explicitly consider a joint operation of a sequence of two or three drainage structures. In addition, one of the studies made the incorrect assumption that the culverts will operate under upstream control (inlet control) conditions, which led to an over-estimation of the amount of water that could flow through the culvert under flood conditions.
97. **The Panel found a lack of coherence among the basic criteria used in the hydrological studies for the three sections of the Road. The Panel also finds that there are several technical shortcomings in the Project's hydrological studies and the hydraulic analyses. These shortcomings show a lack of rigor and robustness of the performed hydrological analysis and introduce an important degree of uncertainty in the results of the hydraulic analyses.**
98. The Panel notes that only when the different methodologies were explicitly pointed out by the Panel's expert, did Bank staff involved seem to acknowledge the lack of coherence and consistency in the methodologies used by the consulting firms. No explanation was given as to why different methodologies were applied and the reasons and consequences of this approach for the final design. **The Panel finds that Bank staff, during the preparation phase, did not succeed in guiding appropriately the Borrower to ensure a rigorous analysis of flood impacts as required under OP 4.01, paragraph 5.**<sup>61</sup>

#### 4. Additional Studies

99. In May 2007, after the significant flood event of March 2007, Management promptly visited the Project area and requested a review of the technical studies by the engineering firms. At the same time, the PSF made a request for "*a new analysis and re-examination of the design*" to the Ministry of Water Affairs. According to Management, "*the re-evaluations carried out independently by the PSF and the Bank validated the proposed engineering designs and concluded that such designs do not increase the risks of flooding faced by residents along National Road No. 19.*"<sup>62</sup> **The Panel notes that this review employed the same technical and methodological approach of the original studies, which, as pointed out earlier, suffered from several shortcomings.**

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<sup>61</sup> BP 4.01 states that: "the TT and the RESU review the results of the EA, ensuring that any EA report is consistent with the TOR agreed with the borrower. For Category A projects, and for Category B projects proposed for IDA funding that have a separate EA report, this review gives special attention to, among other things, the nature of the consultations with affected groups and local NGOs and the extent to which the views of such groups were considered; and the EMP with its measures for mitigating and monitoring environmental impacts and, as appropriate, strengthening institutional capacity."

<sup>62</sup> Management Response, ¶ 23.



100. Additional studies were conducted after discussions between the Project experts and the Panel's expert consultant during the Panel's visit to the Project area in October 2008. Specifically, after the Panel's visit, the PIU requested the consulting companies who had undertaken the original engineering design studies to carry out additional studies to *"provide additional elements that would clarify the hydrological impact"* of the project<sup>63</sup>. The additional studies were designed to overcome the shortcomings in the original studies with respect to the *"heterogeneity of the criteria employed by the engineering consulting firms"* in their design analyses and the *"inability to clearly convey to property owners along the route the flood risks with and without the project"*. The studies therefore sought to provide quantitative information on the actual area that would be flooded in the event of specific rainfall events (following design parameters required by national standards in Argentina), and the amount of time that such areas would be flooded. The studies were carried out for two watersheds that cross the Road with the potential for causing serious flooding along the Road – Los Cuatro Sauces and Cañada del Sauce and Arroyo del Sauce.
101. **These 2008 studies showed that, for rainfall events with return periods of 25 and 50 years, the "with Project" situation upstream of the Road was better than the "without Project" situation.** However, for an exceptional rainfall event like the one that occurred in March 2007, the time taken to evacuate all the flood waters from the flood area and therefore the duration of the floods is slightly higher under the "with project" scenario in comparison with the "without project" situation. The studies also showed that the positive effects of the Project upstream of the Road were more pronounced for rainfall events with shorter return periods – i.e. those that would occur more often.

## **5. Overall Conclusions on Analysis of Potential Impacts on Flood Risks**

102. The Panel finds that during Project preparation the necessary studies to demonstrate that, for any given flood event, the area flooded and the length of time that such area is flooded are no greater with the project than without it, were not adequately carried out. In the absence of these studies, it was not possible to make a categorical assertion on this matter as was done in Project documents, especially with respect to Section I of the road design.
103. However, the Panel acknowledges that additional studies were carried out after the March 2007 flood event and more recently after the Panel's October 2008 visit to the Project area. **The Panel finds that, with respect to the assessment of potential impacts upstream of Road 19, the Project is consistent with OP/BP 4.01.**
104. **The Panel also finds that the additional studies carried out represent a positive effort to provide quantitative information about the upstream**

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<sup>63</sup> Email from PIU to TTL, dated 5 February 2009.

**impacts in a form that can be easily understood by the affected parties. The Panel finds that this approach, which involved adjustments to the studies and the design in order to address existing and emerging issues, is consistent with Bank policy on Project Supervision.**

105. On the other hand, an analysis of the Project's impacts on flooding in the areas downstream of Road 19 was not carried out during Project preparation, nor in the additional studies mentioned above. This is important because increasing the capacity of drainage structures (culverts and bridges) will increase the downstream peak's flood as well as the floodplain size (downstream). This may have material consequences that have not been evaluated.
106. **The Panel therefore finds that the ESMP and technical studies did not sufficiently evaluate the Project's "*potential environmental risks and impacts in its area of influence*" as required by OP/BP 4.01 for Category B projects, and did not properly provide for mitigation measures of potential downstream hydrologic impacts.**

## Chapter III: Consultation and Communications with Project Affected People

### A. Introduction

107. **Request.** The Requesters state that consultations and communications with affected people about the Project’s environmental and social impacts were not adequate. They complain, in particular, that communications with landowners about each specific situation were inadequate, and they told the Panel that their concerns about the impacts of the Project on the hydrology situation of the area, and the risk of flooding, were dismissed by Project authorities as unfounded and “non expert theories”, at least until the submission of the Request for Inspection.
108. The Requesters also feel that they were not provided sufficient information to make an informed and satisfactory choice when they signed the compensation agreements. In the context of the land expropriations and compensation negotiations, the Requesters refer to “*intimidatory notices*” received by affected people and “*discrimination*” against some of them during the process.
109. **Management Response.** Management states that the “*consultation process has given numerous opportunities to all interested parties to express their concerns.*”<sup>64</sup> Meetings open to the public were held in the communities where the Requesters live, and email and direct phone communications with the PIU as well as physical mailboxes in 15 localities were established early on. Management adds that the consultations had a critical impact on decision making regarding the Project, as a number of changes to the design were made as a result of these consultations.<sup>65</sup> Some of these changes, for example, were made because of requests by landowners. According to the Response, adequate consultations were carried out and a communication program “adequately” implemented by the PIU and the PSF. In addition, the Bank project team “*has actively participated in the consultation process ... to ensure that the PSF is in full compliance with the ESMP and RAP.*” The team attended community meetings, visited houses and businesses along the Road, and met or exchanged emails or letters with Project affected landowners.
110. Management also notes that meetings were carried out “*regularly*” with the Requesters and other affected people, both during Project design and implementation, to address issues of drainage and flooding. It adds that flooding and drainage issues were discussed “*extensively*” during these meetings when representatives of the three engineering firms that prepared the road design and officials from the Ministry of Water Affairs were present to

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<sup>64</sup> Management Response, ¶ 36.

<sup>65</sup> Management Response, ¶ 37. Paragraph 37 provides specific examples of changes that were made to the design.

address concerns expressed by Project affected people. According to Management, during one of these meetings the Requesters acknowledged that the flooding issues in Santa Fe pre-dated the Project and that resolving these issues fell outside the scope of upgrading of Road 19.<sup>66</sup>

111. **Structure of Chapter.** This chapter addresses the issues related to adequate consultations raised by the Requesters and assesses Bank compliance with the relevant provisions of OP/BP 4.01, OP/BP 4.12 and OP/BP 13.05, in both the Project's design and the implementation phases. It starts with a summary of the strategy proposed in the Environmental and Social Management Plan (ESMP) and the Resettlement Action Plan (RAP) to consult and communicate with the Project affected people during the design stage of the Project, and analyzes the actions taken to implement the strategy. The chapter follows on by focusing on the strategy for consultation and communication with the sub-set of people whose property was to be expropriated, including a small group who were to be involuntarily re-settled. It finally reviews the consultation and communication strategy in the project implementation stage.
112. **Applicable Bank Policies.** Meaningful consultations with people affected by Bank-financed projects are required by a number of safeguard policies, including the policy on Environmental Assessment (OP 4.01) and Involuntary Resettlement (OP 4.12). According to OP 4.01, consultations about a project's environmental impacts with project affected communities and local NGOs must be initiated "as early as possible" during the EA process, and the views of those consulted must be taken into account. Consultations occur also throughout project implementation to address EA-related issues that have an impact on project affected groups. To ensure meaningful consultations, people must receive relevant information about the project in a timely manner before consultations take place and in a language and form understandable and accessible to those consulted.
113. OP 4.12 provides for meaningful consultation throughout various phases of the involuntary resettlement procedures. According to the policy, "[d]isplaced persons should be meaningfully consulted and should have opportunities to participate in planning and implementing resettlement programs." Project affected people must be consulted, for example, with respect to "technically and economically feasible" resettlement alternatives and options, and on the procedures to establish criteria for eligibility for compensation and/or resettlement assistance.

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<sup>66</sup> Management Response, ¶ 24.

## B. Consultations in the Project's design stage

### 1. Strategies for consultation and communication as set out in the ESMP and the RAP

114. One chapter of the ESMP is devoted to setting out a “*Communication and Community Participation Program*.”<sup>67</sup> The stated objectives of this program were to provide people with adequate information in order to be able to exercise their right to participate in the design of the project. This was to be achieved through the following specific objectives: “*Provide clear and concise information to the population in the area to be affected by the project;*” “*Create adequate mechanisms for participation;*” “*Communicate to those responsible for the social and environmental management of the project the consultations, questions, complaints, opinions and claims received from the population*” and “*Monitor the implementation of this program.*”<sup>68</sup>
115. According to the program, the target audience was seen to include all those who could be in any way affected by the Project, including land and business owners on or near the road, the two school communities to be affected, those living near the contractors’ operation centers and road-users.<sup>69</sup>
116. For the pre-construction, construction and operation stages, the program briefly describes some of the proposed communication methods to be used. For the pre-construction phase, it proposed public meetings in the main communities in the area and separate smaller meetings for those whose land or parts thereof would be expropriated.<sup>70</sup> These meetings aimed at providing information on Project design, including road alignment options and inviting comments and suggestions. The program also described other vehicles for affected peoples to raise issues and concerns with Project staff. These included permanent

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<sup>67</sup> *Plan de Manejo Ambiental y Social. Capítulo 7. Programa Comunicación y Participación Comunitaria.* This document, with no date, though prepared after July 2006, refers to the earlier public consultations that were part of the preparation of the ESMP and the RAP. Data on these plans are summarized in Chapter 8- *Acciones de Comunicación Desarrolladas*. The consultants responsible for the preparation of the ESMP included at least one social scientist with experience in public consultation. It appears as though this chapter was included at the request of the Bank. The “*Ayuda Memoria, Misión de Preparación, Julio 12-14, 2006*” spoke of the need for the ESMP to include a “cross-cutting program in Communication and Community Participation”.

<sup>68</sup> *Programa Comunicación y Participación Comunitaria* p.2 According to the program document, the program was also to be implemented by adhering to certain communication principles adopted by the Bank including: *Transparency*. The procedures, methods, data sources and studies used should be open to all. *Appropriate*: The information should use language and forms that are accessible to all. *Credibility*: The communication should be conducted honestly and with equity. *Responsive*: The communication should be conducted in a way which is completely open to questions and concerns. People should be told how their concerns are to be handled *Clarity*: The language of the communication should be clear in order to avoid ambiguity.

<sup>69</sup> *Programa Comunicación y Participación Comunitaria*, p.3.

<sup>70</sup> *Programa Comunicación y Participación Comunitaria* p.6.

information centers and email access<sup>71</sup>. Mass media, including use of radio, press and TV were to be used to provide basic information on the Project and inform the public on how and where to access additional information.

117. In setting out how this communication program was to be implemented, the ESMP states that a Coordinator for Communication and Community Participation would be designated by the PIU with the responsibility for ensuring interagency coordination in implementing the program.<sup>72</sup>
118. The RAP in turn summarizes the ESMP communication program and identifies the Environmental Unit of the DPV as the responsible agency for coordinating the activities outlined, under the overall coordination of the PIU.<sup>73</sup> The RAP identifies two distinct target groups for communication and consultation: firstly those in the area of influence of the project who will continue to live in the area, and secondly those whose property will be expropriated. It states that in addition to the information shared at public meetings, those who were to lose land would receive written communications in their homes informing them of the expropriation process. The RAP states the importance of establishing permanent, efficient and rapid channels of communication to respond to the concerns of the community. It further says that these should include easily accessible information centers, email and special mail boxes.<sup>74</sup>

## **2. Consultation with the wider community in the design stage**

119. The PIU is responsible for implementing the Communication and Community Participation Program. According to the PAD, consultations began on April 10, 2006, and “*were carried out in all communities located near the ROW*” so as “*to receive comments and suggestions from the potentially affected communities.*”<sup>75</sup> The PAD also states that “*final draft ESMP and RAP were also presented to and discussed with communities.*”<sup>76</sup> Project records show that initial meetings were held with the elected representatives of five communities (Frontera and Josefina, San Francisco, San Jerónimo del Sauce, Sa Pereira and Santo Tomé) in April 2006 to provide information on the Project. Presentations were made by the consulting engineers and the social and environmental consultant and PSF government officials were present. The elected officials raised many issues of concern and expressed their preferences where options on the road alignment were offered, such as the case of San Francisco.<sup>77</sup>

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<sup>71</sup> Programa Comunicación y Participación Comunitaria pp. 6 and 7.

<sup>72</sup> Programa Comunicación y Participación Comunitaria, p. 7.

<sup>73</sup> Plan de Expropiaciones y Reasentamientos, [hereinafter “RAP”] pp 29 and 30.

<sup>74</sup> RAP, p.30.

<sup>75</sup> PAD, p. 93.

<sup>76</sup> PAD, p. 94.

<sup>77</sup> “RAP, Annex D. This appendix to the RAP contains information on all the public meetings held including names of participants and summary of issues raised. In addition, Appendix 1 to this report lists all public meetings held up to July 2007.

120. Public meetings were also held in three communities (Frontera and Josefina, San Francisco and Santo Tomé) in June 2006 to present the proposed Project.<sup>78</sup> Project records show that between 48 and 54 people attended each meeting. The majority of those attending were government officials, staff of the consulting companies, elected officials and business leaders.<sup>79</sup> The Panel notes that, according to the reviewed documentation, only a minority in this first round of meetings were affected peoples.<sup>80</sup>
121. A second round of public meetings was held in August 2006 to discuss the draft ESMP with those to be directly affected by the Project through land expropriation. Meetings were held in San Agustín, San Carlos Norte, San Jerónimo del Sauce, Sa Pereira, San José and Frontera and Josefina. Attendance ranged from 5 to 30. The President of each community was responsible for informing community members of the meeting. Questions focused on the timetable and process for expropriations, including the valuation of land and improvements. Attendees were told the expropriations would be completed by the end of 2006. A number of the Requesters attended these meetings.
122. On June 7, 2006, with the attendance of Bank staff, the “*Campaña Buzones*” (a Mail Box Campaign to install special mail boxes where citizens could submit questions, opinions and requests for action) was launched. Posters and information on how to use the system were left in each community. At the same time people were invited to submit questions by email.<sup>81</sup>
123. A draft ESMP was disclosed before the round of consultations of August 2006. According to the ESMP, it was available in municipal halls and the PIU for citizens to review it. The full ESMP was disclosed on the PSF website in September 2006 and letters were sent to all the Community Presidents in the area with an executive summary of the ESMP and information on how to access the full report. Later in the month they were sent a copy of the engineering plans. They were also informed that affected people were invited to request meetings in the PIU office in Santa Fe; 10 such meetings were held up to October 2006 and 7 further meetings between October 2006 and February

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<sup>78</sup> Maps of the Road, a short video and an executive summary of the project were prepared for these first community meetings. The engineering consultants and social and environmental consultants made the presentations. Questions were put to the engineers on different aspects of the proposed plan.

<sup>79</sup> The lead at these meetings appears to have been taken by the consultants. It appears from Bank reports that there were delays in creating the PIU. The Bank Mission Report for July 2006 included the following statement: “The mission expressed concern that the structure of the PIU had not been defined and stressed the negative consequences, in terms of project risks and delays in project preparation of delaying the decision to set up the implementation unit”. This had implications for the development of a communications plan and the hiring of designated staff.

<sup>80</sup> Ibid. pp. 8-10.

<sup>81</sup> Ibid pp. 24-33 provides documentation on the 89 letters received and gives examples of the action taken. Ibid. section D pp. 1-49 documents the 30 emails received and replies given. This data runs to November 2006.

2007. The last seven meetings were documented and in all cases concerned specific questions about the expropriation process.

124. The PIU organized a third round of community information meetings from 24-26 July, 2007, in the communities of San Jerónimo del Sauce, Sa Pereira, Santo Tomé, San Agustín and Frontera and Estación Josefina. The aim of these meetings was to provide information on progress in Project implementation. Invitations were sent to the *Presidente Comunal* or *Intendente Municipal*, who were asked to invite the public. The number of attendees from each community ranged from 16-60, showing a significant increase from the first round of public meetings. Two Requesters attended the meeting in San Jerónimo and three Requesters participated in the meeting in San Agustín.
125. At each meeting a video was shown and attendees were invited to put questions to a panel comprised of staff from the DPV, PIU and Provincial Department of Water Affairs and the ESMP Consultants. Engineering plans were made available for public consultation and some individual questions were answered with direct reference to the plans. The brief minutes of those meetings indicate that concerns were mainly focused on the possible impact of the road project on flooding. The engineers explained how the risks were to be addressed, factoring in the lessons learned from the March 2007 floods. Those to be affected also asked about whether they would have to pay the cost of improvements to their access roads and were told that those cost would be covered by the project.<sup>82</sup>
126. **The Panel finds that affected people were given the opportunity to meet Project officials to express their concerns and to make suggestions for project design modifications, as required by Bank policy.**
127. The Panel reviewed whether the numerous concerns expressed by people in the Project area were taken into account. The Panel has found evidence that a number of the suggestions for modifications to the Project design made at the community meetings and via letter or email were acted upon. These included both changes affecting groups of beneficiaries and those benefiting individuals. For example, four individual cases are recorded where changes to the road alignment were requested in order to reduce or eliminate the need for expropriation. Three of these cases were resolved to the satisfaction of the claimants.<sup>83</sup> Another recorded case relates to the one of the Project affected people who submitted a Request to the Panel in 2006.<sup>84</sup> **The Panel finds that many of the concerns related to the design of the Road were generally**

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<sup>82</sup> Report by PIU “Organización de reuniones informativas con la Comunidad sobre el avance del Proyecto.”

<sup>83</sup> Plan de Expropiaciones y Reasentamientos, Annex D Chapter 8 p.38.

<sup>84</sup> The RAP includes a Table at p. 18 with requests received during the consultations and how these were addressed.



**responded to and acted on. The Panel finds that this in compliance with OP 4.01.**

128. On the other hand, the Panel would like to draw attention to the fears expressed by the Requesters that the proposed new road may have a negative impact on the hydrology of the area and the claim that their concerns were basically dismissed by Project authorities and Bank staff, until a Request for Inspection raising these issues was eventually submitted to the Panel.
129. The Panel acknowledges that the Requesters were able to meet at various occasions with Project and local authorities and Bank staff, that they could express their worries and, as they state, were always treated with respect. The Panel observed nonetheless during its visits to the Project area and discussions with Project technicians that several of the Requesters' concerns were swiftly dismissed because affected people were sometimes characterized as non experts and not competent to discuss hydrological issues. While the Management Response to the Request for Inspection noted that the Requesters' concerns over the drainage design "*include no engineering or other evidence to support their assertion,*" the Panel notes that the Requesters were likewise not provided initially with all relevant information about impact analyses to support the assertion that the project would not worsen the Requesters' flood risks. **It is the opinion of the Panel that Bank staff did not sufficiently emphasize with the PIU the importance of communicating and consulting affected people on flood risks and taking the Requesters' many years of field-based experience more seriously.**

### **3. Implementation of the Communication Program in the design stage**

130. **The Panel notes that considerable effort was made by the PIU to consult with affected communities, but this process fell short of what had been envisaged in the ESMP and RAP, which was not entirely implemented as planned.** The Panel notes that the hiring of a Communication and Community Participation Coordinator at the start of the Project as recommended in the ESMP could have resulted in a stronger consultation effort.
131. The Coordinator of Communication and Community Participation<sup>85</sup> was not hired at the start of the project design stage. In addition, community information points envisaged in the RAP were only opened in September 2008 during the Project implementation stage, while they had been envisaged to operate since the early preparation phase. This meant that community members wishing to raise their concerns directly had to seek an appointment with the PIU in Santa Fe or go directly to the DPV (Land Directorate),<sup>86</sup> which made Project authorities less accessible to rural communities.

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<sup>85</sup> Plan de Manejo Ambiental y Social, Chapter 7, p. 5, paragraph 1.

<sup>86</sup> As early as July 2006 Bank staff identified the need to set up an office, specifically in Santo Tomé to provide information to the community. (*Ayuda Memoria, Misión de Preparación, July 12-14, 2006*).



**Picture 6: Panel team meeting with main Requester**

132. Another deviation from the communications plan set out in the RAP<sup>87</sup> was that the monthly inter-agency coordination meetings (involving DPV, DNV and the Provincial Land Department) to agree on and monitor a common communication strategy do not appear to have taken place. In addition, the Program called for a document with a communication plan to be distributed at the first meeting.<sup>88</sup> The program contemplated also the publication of a bimonthly newsletter with updates on the Project to be distributed to the press and made available at the community information centers. The program further called for the production of a brochure outlining the RAP and contact information of those responsible for its implementation. The Panel was not provided with evidence that such a publication was produced. However, the Panel received copies of the second issue of the “Boletín Informativo” dated March 2009, describing the Project as a whole.<sup>89</sup>
133. According to Bank staff in Buenos Aires, the Bank had attempted in various occasions to convince PIU management to hire the communication coordinator. The Panel also found evidence in the Aide Memoirs that the Task Team urged the PIU to hire a communication specialist.<sup>90</sup> Only in early 2008 (almost two years after the beginning of Project preparation, with the change of political

<sup>87</sup> RAP, Spanish version p.29.

<sup>88</sup> Plan de Manejo Ambiental Social, Chapter 7, p. 5.

<sup>89</sup> In addition, though a directory of all newspapers and TV and radio stations in the region was prepared, there is no evidence of a plan to use mass media to provide information to those affected on critical issues related to project developments and the rights of those affected. The Program called for a workshop to brief journalists on the project.

<sup>90</sup> See for example Aide Memoire October 30-Nov 1, 2007, ¶6: “All the above requires the hiring of a fulltime professional in Social Communication, as agreed in the mission of September 2007.” In March 2008 “the mission repeated the need to hire a communication specialist before construction work started,” (Aide Memoire March 2008, ¶26).

leadership in the provincial administration) was a person with community development skills hired, followed by an additional hiring of a communication specialist in July 2008.

134. In interviews in Santa Fe, PIU staff admitted that a clear communication plan was not put in place at the start of the Project. They said they learnt from the first community meetings what was required to make the information clearer for the public in subsequent meetings. They argued however that the approach to communications and consultation had improved over the life of the Project.
135. Bank consultants and PIU staff interviewed recognized that the commitment to genuine community consultation, as opposed to information dissemination, varied among the technical staff responsible for facilitating the community level meetings. They said that some of the engineering consultants viewed community consultation as a formality and lacked the communication skills required to present information clearly and concisely.<sup>91</sup>
136. This extensive delay in hiring an individual with special skills to manage the program of communication and consultation with the target population meant that the critical communication and consultation components of the Project, in particular disclosure of timely and complete information, were managed by engineering staff largely without experience or skills in community consultation. **The Panel notes that the delays in hiring the communication expert led to some delays in adequately implementing the communication and consultation program and this may be at the root of some of the complaints of the Requesters and other affected people.**
137. **The Panel finds that Bank staff emphasized the need to hire a communication expert within the PIU on a number of occasions since Project preparation, although this eventually happened only in July 2008. The Panel finds that this is in compliance with OP/BP 13.05 on Project Supervision.**

## **C. Information and Consultation with directly affected landowners**

### **1. Consultations at the baseline survey stage**

138. During the Panel's visits to the Project area, some of the Requesters complained that the partial expropriation is detrimental to their economic situation because, as a result of the partial taking, their remaining landholdings would be less productive in a proportion greater than the land taken, and would result in lower

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<sup>91</sup> An additional challenge mentioned by a Bank consultant was that in some cases the local Community Presidents were resistant to community level consultations as they believed that it was the responsibility of the elected political leaders to act on behalf of their constituents. However others were supportive of the consultative process.

incomes. They claim that they were not consulted about the economic damage the Project will cause them, that no socio-economic survey had been carried out to determine the potential impact of the expropriation, and that the Project does not provide for measures to mitigate this harm. One Requester reported that he believed that the consultants placed heavy reliance on the 1970 data and therefore were unaware of the fragmentation of holdings that had occurred since then. Another reported that his father's land had never been surveyed.



Picture 7: Panel Team meeting with an affected landowner

139. According to Management Response, under the Project lands are acquired in accordance with the laws of the PSF.<sup>92</sup> The Province “*agreed with the Bank to follow Bank compensation policies for land acquisition.*”<sup>93</sup> Management’s Response describes the valuation methodology followed by the DPV in order to establish the amount of compensation to be paid. This amount has to be equal to the “objective” value of the land (“*valor objetivo*”) plus direct/indirect damage caused by the expropriation of the land. Various elements are taken into account to evaluate rural land, such as quality and productivity of the land, soil configuration, and real or presumed rent/income from the land. Other characteristics, including the location of the land and the expropriated area of affected land, also contribute to determining the final price offered to the landowner.
140. Management also states that “[c]onsistent with Bank policy, the PSF prepared a RAP that meets the requirements of OP 4.12” It adds that the RAP includes a number of programs for owners of land to be acquired, for households and businesses, including a communication and consultation program.

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<sup>92</sup> See Management Response, ¶31 for a brief description of the land acquisition process.

<sup>93</sup> Management Response, ¶32.

141. OP 4.12 covers direct economic and social impacts that result from Bank-financed operations and are caused by a taking of land resulting in, inter alia, loss of assets and “*loss of income sources or means of livelihoods, whether or not the affected persons must move to a another location*”. According to the policy, resettlement programs should be conceived and executed as sustainable development programs and displaced persons should be assisted in their efforts to improve or at least restore their standards of living to the pre-displacement levels. Persons who have formal right to land are provided with compensation and other assistance in accordance with the policy. Therefore a resettlement plan should include measures to ensure that displaced people are provided compensation at full replacement cost for losses of assets and development assistance in addition to compensation – e.g. credit facilities, trainings etc. – “*where necessary to achieve the objectives of the policy.*” When livelihood is land-based, OP 4.12 states that preference should be given to land-based resettlement strategies, but considers payment of cash compensation appropriate when, for example, only a fraction of land is taken and the residual land ensures economic viability.
142. A review of the Project’s RAP shows that potential impacts resulting from the upgrading of Road 19 on the surrounding lands were identified and divided in categories, i.e. total or partial loss of land, loss of housing and total or partial loss of income. A socio-economic analysis was conducted for those properties where more than 40% of land was taken or include “*mejoras*”, an improvement on the land, such as housing or other structures. Within the latter, the survey identified those families who were deemed to need resettlement assistance. The Project impacts on these cases (26 cases, based on RAP data) were analyzed in depth by management and a specific program called “*Re-establishment of Socio-Economic conditions of the affected population*” prepared. **With respect to this category of affected people, the Panel finds that the RAP is in compliance with OP 4.12.**
143. According to the RAP, for those properties where less than 40% of the land was taken or those that had no “*mejora*”, only cadastral and land use data were gathered. Although a number of affected people fell in this category, such as the Requesters, the Panel was not provided with evidence that a policy-consistent socio-economic analysis to evaluate the impact of losing only a fraction of land was prepared as part of the RAP. Nor does it seem that, during Project preparation, consultations with these landowners sufficiently addressed the potential negative impacts of the partial expropriation.
144. On the other hand, Bank staff told the Panel that while a detailed socio-economic study was not carried out, partial expropriation was compensated. In addition, landowners were offered expropriation of their entire property if the land would no longer be economically viable as a result of the partial expropriation, as allowed under local legislation. The Panel was also informed during its investigation visit that affected landowners not qualifying for the

RAP's socio-economic restoration program were offered measures to mitigate potential negative economic impacts of the partial expropriation, such as technical advice, information on productive projects carried out by the PSF, and assistance in coordinating actions with local business. The Panel, however, learned that some of this assistance was offered to some of the owners of partially affected properties only recently, after the PIU was strengthened by incorporating social and communication experts.

145. **The lack of a complete socio-economic analysis covering all people affected by land acquisition is not consistent with OP 4.12. However, the Panel also finds that communication with landowners on this aspect significantly improved during Project implementation and that some measures to address the potential negative impacts of the partial taking were provided for. The Panel finds that although initially there was only partial compliance with OP 4.12, the situation improved as a result of Bank staff's compliance with the policy on supervision (OP 13.05).**

## **2. Land acquisition phase – involuntary resettlement**

146. The Requesters claim instances of non-compliance with Bank operational policies and procedures, including “*intimidating notices*”, and “*discrimination*” practices in dealing with landowners during the land acquisition process, which in turn led to “*inequity of the values*” given to landholdings. They claim that the communication and consultations about each landowner's specific situation was inadequate.
147. Management states that “*the PSF is applying adequately the provisions of the RAP and the Provincial law that regulates expropriations*”<sup>94</sup> and that the Bank and the PIU have worked with the Requesters and other affected landowners to address their issues and “relations have been cordial and constructive.”
148. The Response also states that a RAP was prepared in accordance with OP/BP 4.12 on Involuntary Resettlement, and it would be implemented before commencing the physical works. The RAP includes an information and communication program; for landowners and households and businesses to be displaced, “*additional programs are included*.”<sup>95</sup>
149. As noted above, the Requesters complain about inequities in the land acquisition process, inadequate communication and information sharing with the landowners, and discrimination against some of them in the land acquisition process. Some also claim intimidating practices against some landowners to accept the value offered.

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<sup>94</sup> Management Response, ¶ 28.

<sup>95</sup> Management Response, ¶ 29.



150. According to Management, evidence shows that the PSF has been conducting this process in an equitable way, taking also into account that *“rural land valuation under the best circumstances inevitably involves a degree of subjectivity ... [because] [n]o two plots of lands are ever identical so comparisons with neighboring plots as a valuation basis can never be perfect.”*<sup>96</sup>
151. The RAP describes the legal framework to be applied in the expropriation process and the rights of those whose property is to be expropriated. The RAP states that a monitoring system would be put in place to verify that the activities proposed in the Plan to protect the wellbeing of individuals are effective. This would apply in particular to the expropriation process and the implementation of social and economic activities for those being displaced.<sup>97</sup>
152. During the investigation, the Panel found that Bank staff gave priority to monitoring the actions taken with those who had to relocate to ensure that OP 4.12 was adhered to. This included attending a number of meetings between PIU staff and those affected.<sup>98</sup> The Panel met with two of the affected families and they confirmed that all the negotiations and outcomes had been to their satisfaction.



**Picture 8: Panel Team Meeting with Requesters**

153. In the remaining cases where expropriation was required, responsibility for communicating with and reaching agreements with each family was the responsibility of the DPV. The Panel was informed by PIU staff that DPV staff members were supposed to make a written offer of compensation and then follow up with a visit to agree on the final terms. However the Panel heard

<sup>96</sup> Management Response, at note 30.

<sup>97</sup> RAP (Anteproyecto Nov 2006, p.75).

<sup>98</sup> See Management Response, ¶39 and PIU Report (Informe de Avance al 30 de Septiembre 2008), pp. 10-11.

complaints directly from Requesters and others that pressure had been applied to accept compensation offers that they considered below market value; in other cases, the owners had not been visited and had only received written notification.<sup>99</sup> Other affected people complained that they felt they were discriminated against in the expropriation process, as the value offered for their land was lower than that offered for neighboring lands.

154. There were differences of opinion among affected people regarding the fairness of the cash compensation received. One expressed the view that by making a counter offer he was able to negotiate improved final compensation. Another gave the view that the communication that took place between the affected persons along the ROW had helped them collectively to get a better sense of market value and increased their ability to get reasonable compensation. Yet another gave the view that a number of elderly people, including his own father, had accepted what he considered low offers of compensation because they feared that they would be taken to court if they did not accept the offer.
155. It is difficult for the Panel to verify the above claims. The Panel observes that, specifically during its eligibility visit, it had constructive meetings with PIU staff, DPV and other agencies officials where some of the concerns of the affected people, especially in relation to land acquisition, were brought to the attention of those present at the meeting. However, it appeared to the Panel team that information that was shared with the Panel to explain and respond to such concerns had not always been clearly and transparently provided to the affected people. For example, Management acknowledged that soil classification maps, which could clarify why different land values were assigned to contiguous landholdings, were not shared with affected landowners. This, in turn, generated perceptions of unfairness in the land acquisition process among some landowners. The Panel, however, did not find any evidence of intimidating notices having been sent to landowners.
156. Bank management states that “*Management takes very seriously any allegation of discrimination and intimidation and therefore Management will follow up closely on this issue to confirm that no such incidents have taken place and to ensure that all communications are proper.*”<sup>100</sup> The Panel was told that Bank staff had worked with PIU staff to develop a matrix to monitor the expropriation process in all properties. This was updated by PIU staff and reviewed by Bank staff on their periodic monitoring visits. The PIU was also required to send a monthly report to the Task Team Leader reporting on progress on the implementation of the RAP. At the time of the Panel’s visit,

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<sup>99</sup> The only written communication we have seen is a sample letter of 26 December, 2006 sent by the PIU to all whose land was to be expropriated advising them that they would be visited by staff of DPV and referring them to the PER on the website which sets out the legal parameters. The letter also invited them to contact the PIU by email, telephone or in person.

<sup>100</sup> Management Response p.7 and Aide Memoire November 2007.



PIU staff informed the Panel team that 195 cash compensation agreements had been signed and 34 were under judicial review. Two schools were the property of the state, one property was now not going to be affected because of the change of Road, and 13 cases were still being processed.

157. During the investigation, Bank staff interviewed by the Panel stated that the Project team was strengthened with consultants based in Argentina who could visit the Project area and monitor progress more frequently and regularly than staff coming from Washington. In the Panel's view, this seems to be a good and cost effective practice to supervise project implementation.
158. When asked about the likelihood of abuse happening in the expropriation process, PIU staff answered that checks and balances exist within the DPV (including audit by the "*Tribunal de Cuentas*" at the time each compensation payment is approved) to ensure that abuse does not happen. They also stated that all affected people have been informed of the existence of an appeals process via the provincial ombudsman's office. At the time of the Panel's visit, the ombudsman has received no complaints.
159. In exercising this responsibility, Bank Staff from Washington, as part of their monitoring activities, had conducted a random sample of five case files at DPV and found no evidence that established procedures for expropriation and land and structures valuation had not been followed.<sup>101</sup> The Panel did not find any evidence of intimidating notices having been sent to landowners. However, it is possible that some landowners may not have been given sufficient opportunity to consider options and may have felt pressured into accepting compensation offers. The Panel notes nonetheless that some Requesters informed the Panel that the expropriation process eventually concluded to their satisfaction.
160. **The Panel finds that information provided to the affected people during the land acquisition process was not always adequate. However, the Panel finds that after initial difficulties, information sharing and related consultations in the land acquisition process improved over time, especially after the submission of the Request for Inspection. The Panel finds that with this improvement the Project is now in compliance with OP 4.12.**

#### **D. Consultations during the Project implementation stage.**

161. Construction had been underway for over four months when the Panel visited the Project area in October 2008. This enabled the Panel team to collect information on the communication system put in place by the contractors and the PIU to transmit information to the general public, and to determine what extent Bank staff was involved.

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<sup>101</sup> Management Response, p.14.

162. The PIU finally hired a communication specialist in July 2008 as head of Program 8 (Communications and Community Participation) to coordinate a communications plan to ensure that people in affected communities are fully informed of construction plans and are given the opportunity to present complaints and have them acted on. To date, the plan has consisted of organizing public meetings, opening community information centers and providing information to the media and to the public through handouts.<sup>102</sup>
163. Between August 27 and September 4, 2008, public meetings were held in various communities to present the road construction progress reports and plans and explain how community members could present concerns and complaints and how these would be handled. Meetings were attended by staff of the PIU, DPV and Public Works and the Directors of Works of the construction companies. Three of the meetings were attended by a World Bank consultant from the Buenos Aires office. One of the meetings was suspended because of low public attendance. Between 20 and 120 members of the public, including students, attended each meeting. Journalists participated in most of the meetings and radio reporters participated in two. Members of the public were given opportunity to raise issues and concerns at the meetings. These covered such issues as the quality of the fencing to be provided for properties facing the road and access to the properties during the construction. Most but not all questions were answered at the meeting.
164. Six “*Puntos Comunitarios*” (Community Information Centers) were opened on September 1, 2008, to provide information to the public in Santo Tomé, San Agustín, San Jerónimo del Sauce, Frontera, Estación Josefina, Clucellas and Sa Pereira. They are staffed by agents appointed and trained by the construction companies. The Panel was informed that the companies had been asked to select individuals with experience in communication, but this could not be verified.<sup>103</sup> These centers are scheduled to be open two hours every morning from Monday to Friday. Availability of this service has been communicated by posters and press announcements and through the offices of the Community Presidents.
165. Each enquiry is to be registered. If the agent cannot provide an immediate answer, the question is referred to the appropriate party for action. The agent is responsible for follow up and ensuring the individual submitting the enquiry or complaint is satisfied.

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<sup>102</sup> Informe Programa de Comunicación, PIU 29 October, 2008.

<sup>103</sup> The Project Team had reacted positively to inclusion of the requirement to hire “social communicators” in contracts with the construction companies. It emphasized the need for the PIU to coordinate the communication actions during the implementation phase to guarantee that the strategies used and communications content were homogeneous along the entire Road. (*Ayuda Memoria*, October 30-November 1, 2007).

166. The Inspection Panel Team visited the information center in San Agustín. It was located near the town center in a modest building provided by the community. The center was clearly underused at the time of the visit, but the Panel was told that once construction starts in the San Tomé section of the road more enquiries were anticipated. The agent responsible for the center said he had received fewer than twenty enquiries in the month since the center opened. Only 36 enquiries had been received by all the centers in the course of a month. The Panel was also informed that the Communication Coordinator visits the information centers regularly to monitor the program and give advice to the agents. The Communication Coordinator said he also holds monthly meetings of all six agents/contact persons to exchange experience.
167. The Panel heard some criticism about this service to date. One of the Requesters, for example, told the Panel he had attempted to use the information center in the community of San Jerónimo del Sauce but in twelve visits to the center had failed to find it open.<sup>104</sup>



Picture 9: Panel team visits the *Punto Comunitario* in San Agustín

168. The Panel Team was informed nevertheless, when it visited the Works Manager of the first section of the road, that he had received many visits from affected people who had questions or requests about the construction. These usually related to access difficulties caused by the construction crews or safety factors. The works manager said that he is deeply aware of the need to win the cooperation of the local community in order to be able to work effectively. He said they were facing problems because the Project design did not fully consider the need to divert power and telephone and gas lines. One of the Requesters raised the issue of the difficulties being faced by the local telephone cooperative as a result.

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<sup>104</sup> The Requester in question had attended the Public Meeting in San Jerónimo on September 2<sup>nd</sup> 2008 at which the opening of the Community Information Center was announced.

169. In the same discussion with the Works Manager, the Panel sought to determine whether he was following the RAP guidelines related to the rights of those whose land has been expropriated. The Works Manager confirmed that before any construction work is started, he is required to confirm with the PIU that compensation for the land in question has been paid or a legal process is in place and the cash compensation deposited in an escrow account. This information indicates that the Bank has ensured that the Borrower is acting in conformity with the provisions of the legal agreements signed with the Bank with regard to one of the main provisions of OP 4.12, namely paragraph 10, which states that “taking of land and related assets may take place only after compensation has been paid.”
170. The Panel also notes that at the time of the investigation visit in October 2008, the PIU had recently prepared and was distributing a brochure for affected people explaining the design of the road with respect to drainage and flood risk management, indicating which locations along the road are at a higher risk and what preventive and mitigating actions are to be implemented. The Panel commends this initiative but notes that such actions were implemented only after the Communication Coordinator was on board in July 2008. The communication program also called for the production of a brochure outlining the RAP and contact information of those responsible for its implementation. The Panel was not provided with a copy of such a publication. The Panel was provided however with the second issue of a general information pamphlet (*Boletín Informativo*) about the Project dated March 2009.
171. As noted above, these delays in implementing communication actions may have greatly contributed to the lack of communication lamented by the Requesters and other affected people. The Panel notes that this level of communication with affected people earlier in project preparation could have helped address some of the concerns of Requesters and other people.
172. The Panel notes that for quite some time communication and consultations with affected people about flood management problems seem to have been limited to providing information, rather than listening and taking views of affected people into account. The Panel, however, notes that this attitude towards the Requesters seems to have positively changed over time. In late 2008, one of the Requesters, for example, was asked to convey in writing his views about the hydrological issues of the project area in the context of updated hydrological studies carried out after the Panel’s investigation visit to Santa Fe.
173. In conclusion, Bank staff has ensured that the PIU hired a communications specialist and put in place a Communications and Community Participation strategy for the Project Implementation Phase. The PIU eventually also hired a part time social specialist with experience in community work in early 2008. These actions incorporate many elements contained in the original

Communication and Community Participation Program set out in the ESMP. The Panel notes that this is an indication that lessons have been learned from the omissions during the design phase.

174. **In light of the above, the Panel finds that, while some delays could have been avoided, the consultation and communication strategy during Project implementation is consistent with OP 4.01 and OP 4.12, and Bank staff is in compliance with the Bank policy on Project Supervision (OP 13.05).**

## Annex A: Table of Findings

Issue	Management Response	Panel's Findings
Environmental and Social Management Plan (ESMP)	Based on the safeguard screenings, Project met with Category “B” environmental assessment protocols. Because the expanded ROW is located along existing roadway and surrounding area is already intensively developed for livestock and commercial crops, the EA concluded no significant displacement or adverse environmental impacts are expected. The ESMP takes account of all problems encountered and proposes mitigation measures which reflect the input of affected people and local governments.	<p>Panel finds that Project was correctly categorized as “B,” in compliance with OP/BP 4.01.</p> <p>Overall ESMP contains a thorough assessment of social and biophysical aspects of Project.</p> <p>However, Panel finds it does not include a proper description and analysis of Project’s potential impacts on flooding risks upstream and downstream of Road 19. Panel finds therefore ESMP is not fully in compliance with OP/BP 4.01.</p> <p>This shortcoming does not seem to be the direct result of “Category B” classification of Project.</p>
<b>Analyses of Project Impacts on Flooding</b>		
Hydrologic and Hydraulic Analyses	Plans paid particular attention to hydrological conditions in the area, which were reviewed and approved by the Bank, the Provincial Road Directorate (DPV), the Provincial Ministry of Hydrological Affairs, and the National Road Directorate (DNV). Studies found the risk of flooding will be reduced because of the elevated roadway. The design conducted by a well-respected professional engineering firm met stringent quality control measures, ensuring the height of the road would neither cause a “dam effect” nor result in increased flooding. The Province of Santa Fe’s Ministry of Water Affairs also	<p>Panel finds a lack of coherence among basic criteria used in hydrological studies for the three sections of Road 19. Panel finds there are several technical shortcomings in Project hydrological and hydraulic analyses. These shortcomings show a lack of rigor and robustness of performed hydrological analysis and introduce an important degree of uncertainty in results of hydraulic analyses.</p> <p>Panel finds, during preparation phase, Management did not succeed in guiding Borrower appropriately to ensure a rigorous analysis of potential</p>

Issue	Management Response	Panel's Findings
	carried out an additional assessment along with the Bank following the March 2007 flooding, both independently confirming the proposed designs.	environmental impacts as required under OP 4.01, paragraph 5.
Additional Studies and Supervision	Bank and PSF Ministry of Water Affairs carried out assessments that independently confirmed the original designs after additional flooding occurred. In this instance, as well as throughout the preparation phase, Project Team took an active role to ensure engineering designs comply with sound standards that satisfactorily address the risks of flooding, even though the problems pre-date the infrastructure project.	Panel finds additional studies employed the same technical and methodological shortcomings of original studies. Nonetheless, Panel also concludes additional studies during Project implementation represent a positive effort to provide quantitative information about upstream impacts in a form easily understood by affected parties. These studies showed that, for rainfall events with return periods of 25 and 50 years, the “with Project” situation upstream of Road was better than the “without Project” situation. Panel finds this approach, which involved adjustments to the studies and design in order to address existing and emerging issues, is consistent with Bank policy on Project Supervision.
Overall Conclusions	Requestors offered no new evidence to call into question the studies and analyses. Project Team, along with PSF, took into account concerns of project-affected peoples and through sound hydrological studies created the best possible design to meet infrastructure needs in a flood prone area.	<p>Panel finds, with respect to assessment of potential impacts <u>upstream</u> of Road 19, Project is now consistent with OP/BP 4.01.</p> <p>Panel finds ESMP and technical studies did not fully evaluate Project’s “potential environmental risks and impacts in its area of influence” as required by OP/BP 4.01, and did not properly provide for mitigation measures of potential downstream hydrologic impacts.</p>

Issue	Management Response	Panel's Findings
<b>Consultation and communication with affected people</b>		
Consultation and Communication Program with Wider Community	Consultation process gave numerous opportunities for interested parties to express concerns, which were critical to the design decision-making process, prompting several changes to Road 19. PSF is carrying out the RAP, which includes an information and communication program satisfactory to the Bank. Project team has actively participated in the consultation process	<p>Panel finds affected people were given opportunities to meet Project officials to express their concerns and to make suggestions for project design modifications, as required by bank policy. Panel finds concerns related to design of the Road were generally responded to and acted on. Panel finds this is in compliance with OP 4.01.</p> <p>Panel notes delay in hiring communication expert led to some delays in adequately implementing communication and consultation programs and this may be the root of some complaints of Requesters and other affected people.</p> <p>However, Panel notes Bank staff emphasized the need to hire a communication expert within PIU on a number of occasions since Project preparation, although this eventually happened only in July 2008. Panel finds this is in compliance with OP 13.05 on Project Supervision.</p>
Communication on Flood Risks	PSF met regularly with 2007 Requesters and other project-affected peoples during project preparation and implementation to discuss flooding and drainage issues. The Request for Investigation offered no additional scientific or engineering proof to discount the road design and the additional precautions already taken for a flood-prone area.	Panel notes Requesters were able to meet with Project and local authorities and Bank staff to express their worries. Panel finds Bank staff did not sufficiently emphasize with PIU the importance of communicating and consulting with affected people on flood risks and taking Requesters' many years of field-based experience more seriously.
Communication with Directly Affected Landowners	PSF agreed to use Bank compensation policies for land acquisition, and Bank, at that	Panel finds information provided to affected people during land acquisition



Issue	Management Response	Panel's Findings
	<p>time, found no evidence of intimidating communication or discrimination by PIU or any provincial agency towards land owners. Management believed PSF adequately applied provisions of RAP and provincial laws that regulate land expropriation, as determined through a sample examination of administrative files on valuation of land and structures. Requesters also voiced concerns about productive land, which Project team accommodated.</p>	<p>process was not always adequate. However, Panel finds communications with landowners improved over time, especially after submission of Request for Inspection. Panel finds that with improvement in the consultation process Project is now in compliance with OP 4.12.</p> <p>Panel finds lack of complete socio-economic analysis covering all people affected by land acquisition is not consistent with OP 4.12. However, Panel also finds communication with landowners on this aspect improved significantly during Project implementation and that some measures to address the potential negative impacts of the partial taking were provided for. Panel finds that although initially there was only partial compliance with OP 4.12, situation improved as a result of Bank staff's compliance with policy on supervision (OP 13.05).</p>
Continuing Project Communication	<p>Consultation process has given numerous opportunities to interested parties to express concerns. Communication channels include: meetings open to public in communities where 2007 Requesters live or own properties, an electronic mailbox, mailboxes placed in 15 localities along corridor, and direct telephone communication with PIU.</p>	<p>Panel finds that, while delays could and should have been avoided, the consultation and communication strategy during Project implementation is consistent with OP 4.01 and OP 4.12 and Bank staff is in compliance with requirements of Bank policy on Project Supervision.</p>

## **Annex B: Assessment of Flood Risks**

1. As indicated in Chapter 2, the ESMP does not provide information on the actual area that would be flooded in the event of specific rainfall events and the amount of time that such areas would be flooded. The ESMP describes only the studies carried out by the engineering firms to design the Project's drainage structures and ensure that the flood waters could be evacuated by these structures and did not overtop the road. These studies, however, did not assess the hydrological impacts of the Project as would have been expected in an environmental assessment.
2. This annex, prepared by the Panel's Expert in Hydrology, aims to make clear the difference between the two kinds of studies. Specifically, it describes the kinds of studies that would be needed to estimate the area flooded and the length of time that such area is flooded for any given flood event. Such studies would need to be undertaken in the nine watersheds crossing Road 19 indicated in Tables 2, 4 and 5 of Annex 1, which have been identified as presenting potential flood risk problems.
3. In order to make a proper evaluation of flooding risk associated with these watercourses it would first be necessary to perform the same hydrologic studies that were carried out as part of the engineering studies. Following Federal Highway Administration (2002 and 2005) and USACE (2001, 2006), these studies would comprise the six tasks outlined below. For each of the tasks, we have indicated in brackets the issues that would need to be addressed to overcome the technical shortcomings in the hydrologic studies identified in Annex C:
  - a. Define the contributing area to each NR 19 watercourse crossing site. (To do so properly, it would be necessary to take into consideration both the natural drainage network and all the surface runoff modifications resulting from artificial drainage channels constructions, channel dredging, etc.)
  - b. Subdivide the watershed in sub-basins (taking into consideration the variability of the basins' morphometric and soil characteristics, land use patterns, main tributaries, artificial drainage channels, etc.)
  - c. Define the watershed parameters related to time of concentration, channel routing, etc. (again considering both the natural and the artificial drainage network).
  - d. Structure the storm design hyetograph considering the spatial and temporal variability that characterizes this region. (Given the flat slope that characterize these basins, the duration of storm hyetographs must be at least equal to 24 hours, and greater than the time of concentration; therefore, in middle size basins longer storm durations must be considered. In addition, as discussed in Annex 1, the selected point hyetograph must

be transformed to an areal average in order to be applied over the whole basin.)

- e. Derive the areal average effective hyetograph. (The Soil Conservation Service method should be used for this purpose, as was done by two of the engineering design firms).
  - f. Transform the areal average effective hyetograph into the flood hydrograph. (The Unit Hydrograph theory should be used for this purpose, as was done by two of the three consulting firms. In the absence of the precipitation and runoff data necessary to derive the characteristic unit hydrographs, the Chow, Maidment, and Mays (1994) suggestions of using synthetic unit hydrographs may be followed. For small watersheds, the Modified Rational Method (MRM) is recommended; in this methodology, the whole storm hyetograph is represented by a single value, expressed as depth occurred in an hour associated to a given return period.)
4. Once the flood hydrograph has been estimated, the next step is to perform the hydraulic analysis. To estimate the area flooded and the length of time that such area is flooded for any given flood event, the hydraulic studies would need to be different from those carried out in the design of the drainage structures, in that **the flood hydrograph must be routed<sup>105</sup> through these drainage structures and the temporary water storage that could form behind them.** To do so properly, the following aspects must be considered:
- The hydraulic regime is subcritical; therefore, the control is located downstream. A proper definition of the downstream boundary condition in crossing site is of paramount importance. In each crossing site, the joint behavior of two cross drainage structures (three in the Project's second phase) must be considered.
  - The hydraulic mathematical model must consider unsteady flow, in order to perform the flood hydrograph routing through the temporary water storage that could form behind the drainage structures, and also through these structures, considering the downstream boundary condition. This analysis will allow the proper definition of flooding dynamics, describing the temporal variation of the size of the flooded area, and therefore, the flooding duration.

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<sup>105</sup> "Flood routing" is a "mathematical procedure for predicting the changing magnitude, speed and slope of a flood wave as a function of time at one or more points along a waterway or channel" (American Meteorological Society, Glossary of Meteorology, n.d.)

- In each case, the capabilities of one-dimensional flow models like HECRAS (2001)<sup>106</sup> should be evaluated. If the one-dimensional model doesn't solve the problem, a more sophisticated model based on a two-dimensional approach must be applied.
  - The hydraulic analysis should be performed for both the current NR 19 and upgrading Project conditions. The results should be presented on topographical maps containing the size of the maximum flooding area and the flooding duration for the two scenarios. To facilitate discussions with affected people, these maps should also show the properties of each of the affected landowners.
5. As can be seen from the above, conceptually, the main difference between the engineering studies and the environmental assessment is that the engineering studies aimed to design Project culverts and bridges to ensure that they will evacuate the design floodwaters and that the road itself does not flood, whereas the environmental assessment should have aimed to determine the changes in area flooded and duration with and without the Project under different rainfall scenarios. Analytically, the main difference is in the hydraulic analyses, since the hydrological studies in both cases aim to calculate a "flood hydrograph." Specifically, the hydraulic analysis for the engineering design uses the flood hydrograph to design the culverts and bridges in such a way that the peak flow can be evacuated through them. The hydraulic analysis for the environmental assessment, on the other hand, requires the flood hydrograph to be routed<sup>107</sup> through the Project culverts and bridges and the temporary water storage that could form behind them, in order to estimate the area flooded and the length of time that such area is flooded.

## ANNEX B BIBLIOGRAPHY

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4. USACE. 2001. *Hydrologic Modeling System. HEC-HMS*. Hydrologic Engineering Center. Version 2.2.2. U. S. Army Corps of Engineers. USA.

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<sup>106</sup> HECRAS widely used hydraulic model for the development and revision of flood studies in developed by the U.S. Army Corps of Engineers (USACE). HEC-RAS is updated periodically.

<sup>107</sup> "Flood routing" is a "mathematical procedure for predicting the changing magnitude, speed and slope of a flood wave as a function of time at one or more points along a waterway or channel" (American Meteorological Society, Glossary of Meteorology, n.d.).

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## **Annex C: Detailed Review of Project Hydrologic and Hydraulic Studies**

1. As indicated in Chapter 2, the Panel reviewed the hydraulic and hydrologic analyses<sup>108</sup> carried out as part of the Project's Engineering Studies and that provided the basis for the assessment of the Project's impact on local flooding events in the EA. This annex contains the details of this review, which was carried out by the Panel's Expert Consultant on Hydrology.
2. To determine the characteristics of the flood flows that would need to be evacuated by the road's hydraulic structures, the hydrologic studies carried out under the Project analyzed the characteristics of the watersheds that cross the Road, including climate, land use and soils and the characteristics of extreme rainfall events in these watersheds; and then estimate the amount of water that would need to flow under and through the road's bridges and culverts. Given these estimated flood flows, the hydraulic analyses determined the design of the road's hydraulic structures needed to properly evacuate these flood flows.
3. The Panel Expert's detailed review focused on examining the hydrologic and hydraulic analyses carried out for the three sections of the Road:
  - Section I: National Road 11 – Provincial Road 6 (Access to San Carlos).  
Length: 29.421 km.
  - Section II: Provincial Road 6 (Access to San Carlos) – National Road 34.  
Length: 46.577 km.
  - Section III: National Road 34-Limits of the provinces of Santa Fe and Córdoba.  
Length: 54.000 km.
4. The examination of the hydrologic and hydraulic analyses of these three sections focused on determining whether these analyses followed accepted best practices, with particular attention to three questions. First, were the hydrologic analyses technically sound and did they properly take into account the changes in land use and existence of informal drainage channels in the area that local residents know have drastically changed runoff patterns in the area and augmented flood flows at the point where they intersect the road? Second, was the analysis of rainfall patterns in the area technically sound and did it properly take into account current and projected changes in these patterns? And third, were the hydraulic analyses technically sound and did they properly take into account the actual conditions under which these structures would operate in practice, taking into account the inadequacies of drainage downstream of the road and thus the likelihood that flow through these structures would be governed by downstream conditions?

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<sup>108</sup> By hydrologic analyses we mean the Project studies that aimed to determine the characteristics of the flood flows that would need to be handled by the road's hydraulic structures. By hydraulic analyses we mean the studies that aimed to determine whether the road's hydraulic structures could properly evacuate these flood flows.

5. The review is divided into four parts. The first focuses on the characterization of the watersheds, including climate, land use and soils; the second on the characteristics of extreme rainfall events; the third on the methods used to estimate the flood hydrographs (i.e., the estimated flows under and through the road's bridges and culverts as a function of time), and the fourth on the hydraulic analyses of these cross-drainage structures.

## **1. Watersheds' characterization**

### **1.1. Landscape topography and delineation of watersheds**

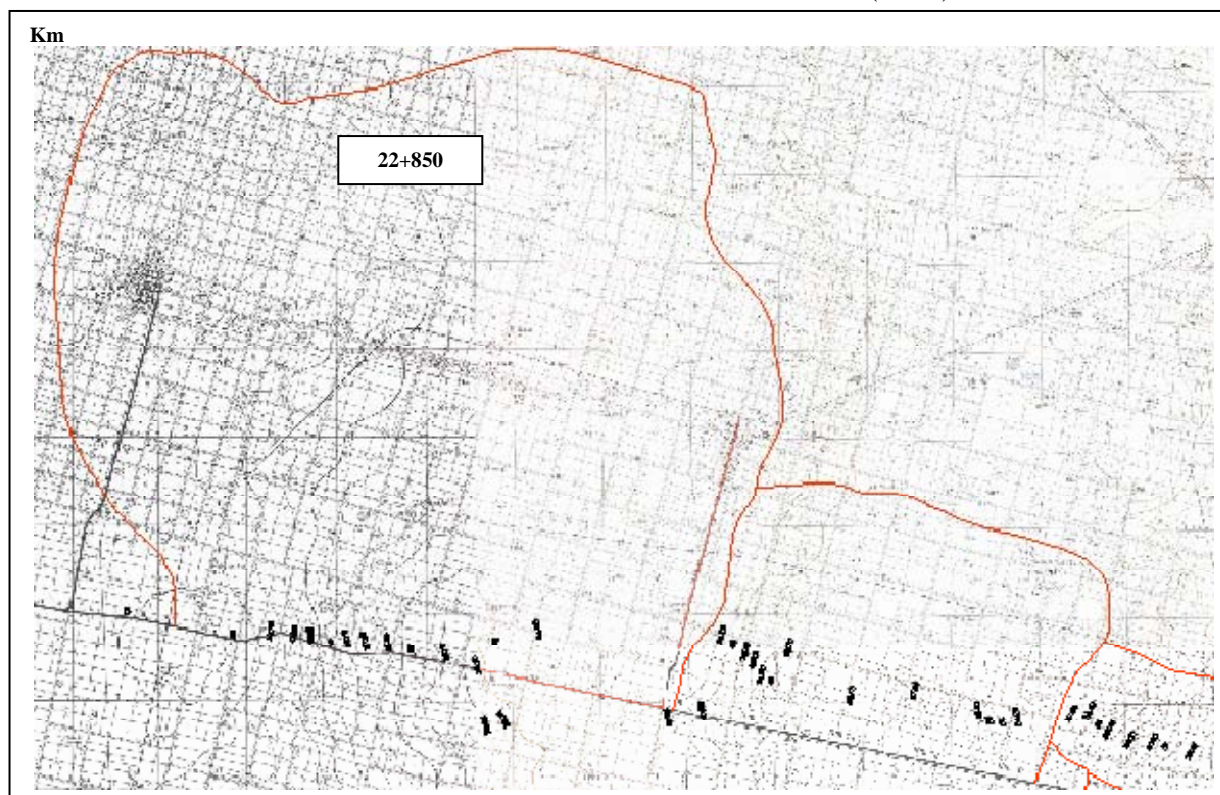
6. From the hydrologic evaluation point of view, one the most important parameters needed to estimate the flows that would need to be evacuated under and through the road's bridges and culverts is the size of the land area that drains the flows generated by rainfall events towards the watercourses that cross the road via these bridges and culverts at specific road crossing sites. This land area, which hydrologists usually refer to as the watershed or drainage basin, can be identified by tracing a line along the highest elevations on a map.
7. According to the consulting engineering firms that carried out the hydrologic studies in the three sections of National Road 19, the watershed areas were estimated using topographic maps on a scale 1:50,000.
8. Several of the drainage basins in the Project area have been affected by informal channels built by the landowners. These channels generated negative externalities because they could change the natural drainage networks, thereby decreasing the watershed response in an extreme storm occurrence and changing the hydrograph shape, leading to a higher peak's hydrograph. During the investigation field visit, the Requesters showed the Panel a map where several artificial drainage channels were drawn on the watershed of two Road 19's crossing points – located on the km 22+850 (*“Arroyo Los Troncos en Los Cuatro Sauces”*) and km 9+900 (*“Cañada de San José”*). According to this map, both watersheds were highly affected by those channels, changing their natural drainage network and the size of the contributing area to each crossing site. In fact, a particular channel on this map crosses in a west to east direction (parallel to Road 19 alignment), connecting *Los Cuatro Sauces* watershed with *La Cañada de San José* watershed. If this map truly reflects the ground situation, this channel could reduce the size of one watershed contributing area and increase the other one, clearly affecting the hydrologic analyses.
9. Problems associated with the construction of the informal drainage channels were discussed in all the meetings held with the engineers of the PSF Hydraulics Department with the consulting firms that designed the hydraulic drainage structures project of Section I, and with the firm that carried out the Environmental Impact Assessment study. There is no evidence resulting from

these discussions that these informal channels were considered in the hydrologic evaluation of Road 19 Section I.

10. Annex 6 of the Management response (page 74) reports that in the evaluation of the drainage area contributing to the crossing site located at km 22+850, the Ministry of Water Affairs of PSF gave a value of 133.75 km<sup>2</sup>, while the consulting firm for Section I considered a value of 196.98 km<sup>2</sup>. The difference between the two values is more than 47 %.
11. These differences in the estimates of watershed areas, together with the map shown by the Requesters and the interviews carried out by the Panel team, show that very important hydrologic parameters, such as watershed size and the related time of concentration (i.e., the time at which the entire watershed begins to contribute to a given road crossing site) are still uncertain, at least with respect to Section I of the Road.
12. Figure 1 below shows the contributing watersheds to critical crossing points of Section I of the Road. Annexes 3, 4 and 5 attached to this Report provide information on the watersheds of sections I, II and III, respectively.
13. **The hydrological studies of sections II and III have explicitly taken into consideration land use changes and construction of informal channels built by the landowners to properly define watershed area and concentration time. This type of analysis was not conducted in Section I.**

**Figure 1. Watersheds of critical crossing points of RN 19's Section I.**

Source: Gobierno de Santa Fe (2006)



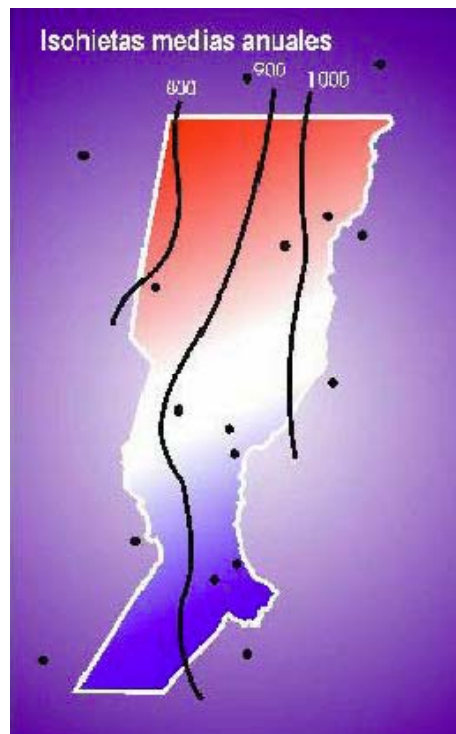


## 1.2. Climatic characterization.

14. The Project area presents a mild climate. Based on Paraná Airport weather station data, the mean temperature is 18.31 °C, with maximum values during January (24.82°C) and minimum values during July (11.52 °C) (Gobierno de Santa Fe (2006)).
15. The mean annual precipitation oscillates between 950 and 1100 mm, with a maximum during April and a minimum in July; additionally, the rainy season goes from November to April. A map depicting the lines of equal average annual precipitation (“isohyets”) for Santa Fe Province is shown in Figure 2; the map shows a gradient in mean annual precipitation from west to east.
16. Figure 3 shows the temporal variation of monthly precipitation at the Paraná Airport weather station. This precipitation pattern is due to the seasonal arrival of wet winds coming from the southern Atlantic anticyclone (Gobierno de Santa Fe, 2006).

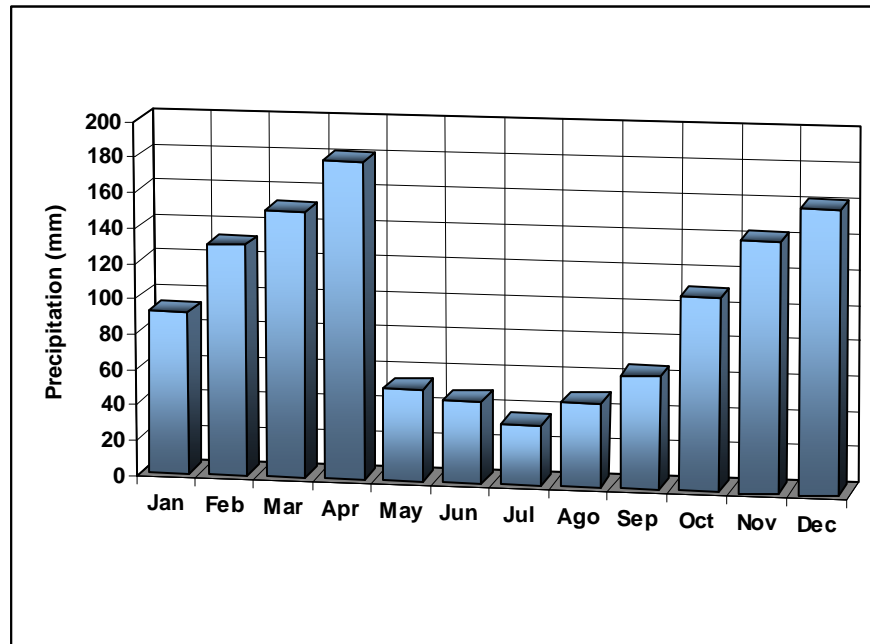
9+900

**Figure 2. Map of Annual Mean Precipitation in Santa Fe Province**



Source: Gobierno de Santa Fe (2006)

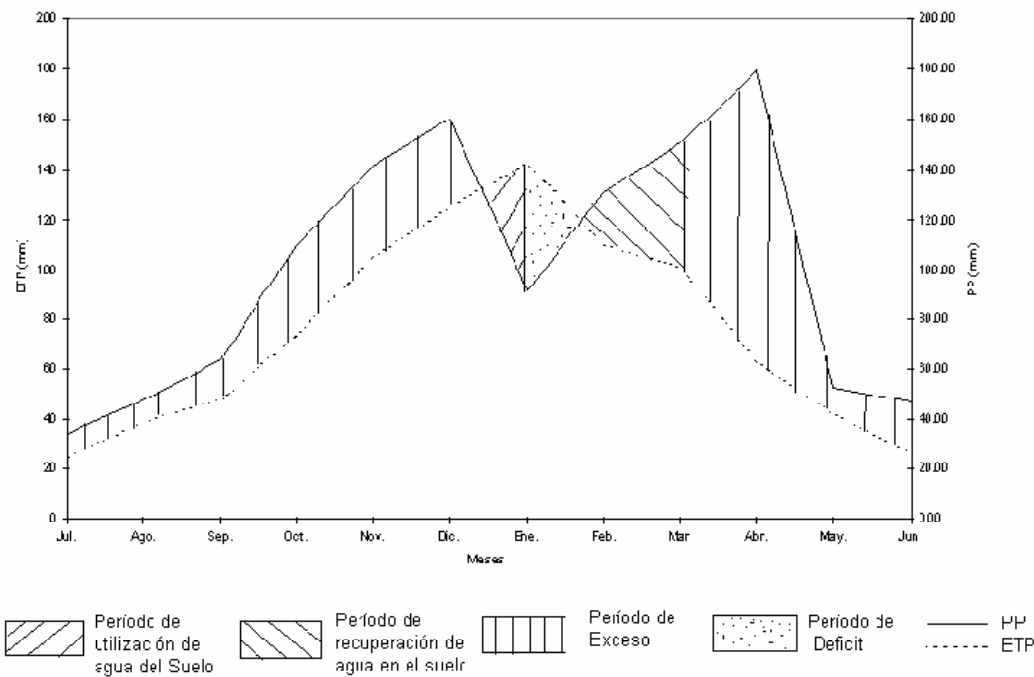
**Figure 3. Temporal variation of monthly precipitation. Paraná Airport weather station**



Source: Gobierno de Santa Fe (2006)

17. The Project's EA (Gobierno de Santa Fe, 2006) (page 15), prepared a monthly water balance using the climatic data of Paraná Airport weather station, which considered the precipitation and evapotranspiration processes and the capacity of soil water storage. The results of this balance are presented in Figure 4, where the monthly precipitation (PP) and evapotranspiration (ETP) are compared, defining the periods of water excess (almost the whole year) and deficits (January). Most of the time the precipitation was greater than the evapotranspiration. **In other words, from the climatic point of view, the main characteristic of the Project area is its excess of water.** The excess of water decreases from east to west, due to the reduction in mean precipitation (Figure 2).

**Figure 4. Monthly water balance. Paraná Airport weather station**



Source: Gobierno de Santa Fe (2006)

### 1.3. Characterization of land uses and soil

18. The soil of the Project area has been formed by wind aggradations. It is loosen, and from the textural categories point of view, can be classified as silty loam and clay loam, with limited subsurface drainage conditions.
19. According to the reference Gobierno de Santa Fe (2006) (page 2), the predominant land use in the region is soybean (95%), jointly with sorghum and forage. Since the beginning of the 1970's, there has been a change in agronomic practices in the project area, with the area devoted to dairy farms reducing and that devoted to agriculture, especially soybean, increasing. As an example, Figure 5 depicts land uses in some parts of Road 19 Section III.
20. The flat landscape that characterizes the Project area has been continuously modified through the construction of roads, crop furrows, drainage channels, etc. This has contributed in a significant way to modifying the watershed response and limiting the water soil storage capacity, which in turn has increased the runoff excess (Gobierno de Santa Fe, 2006).

**Figure 5. Land uses in some areas of NR 19 Section III.**



Source: INCOCIV (2007)

## **2. Extreme rainfall characteristics.**

### **2.1. Temporal variability.**

21. In the Project's hydrological studies, the temporal variability of extreme storms events was described using depth-duration-frequency curves.
22. In order to estimate the hygrograph's peak flow, in most of the small watersheds (Sections I and II), a Modified Rational Method was applied to transform a precipitation "input" into flood flows. The Modified Rational Method uses as precipitation input, or "design precipitation", the rainfall associated with a given event frequency or "return period" for a duration of one hour. The criteria used to define this design precipitation vary for the different road sections.
23. In Section I, the design precipitation for a 25-year return period (i.e., for an event that would occur on average once every 25 years) was determined using the isohyets' map shown on page 35 of Annex 4 of the environmental study (Gobierno de Santa Fe, 2006). This information was multiplied by a factor in order to estimate the corresponding value for a 50-year return period.
24. In Section II, a procedure similar to that described in the previous paragraph was used; however, the values obtained for the 25- and 50-year return periods were multiplied by a factor greater than one to take into consideration a possible climate change effect.

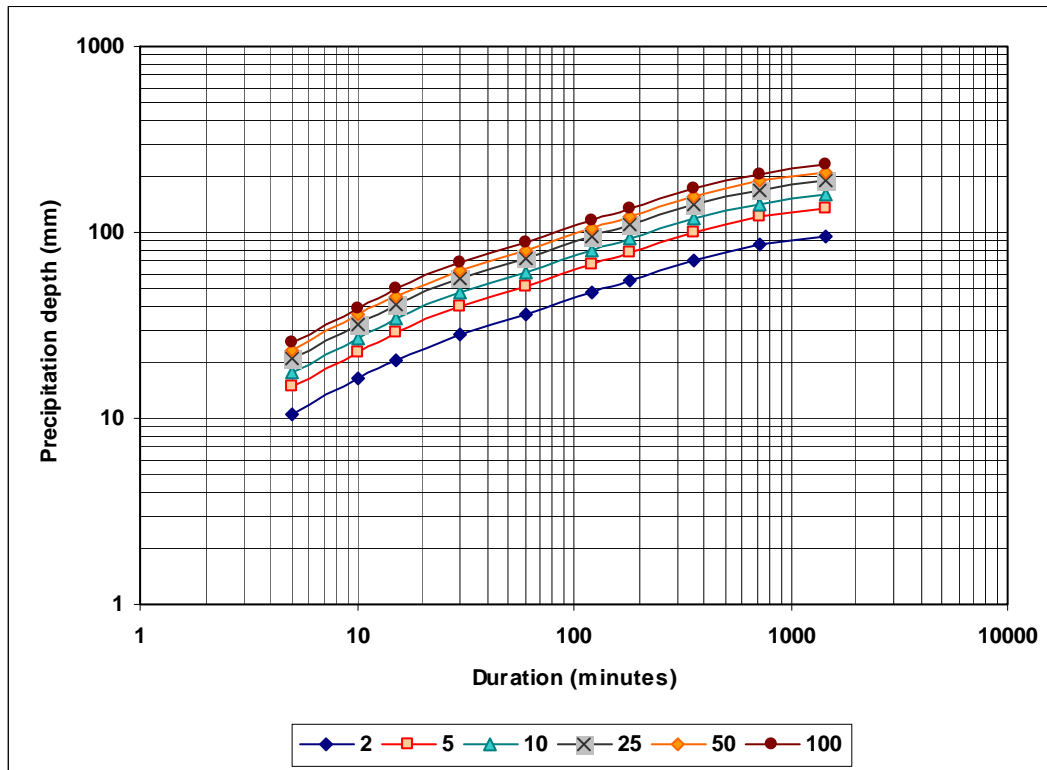
25. In Section III, a Pearson probability distribution was fitted to rain gage data from the city of Rafaela, generating the depth-duration-frequency curves shown in Figure 6 below.
26. Table 1 presents a summary of the design precipitation for the 25- and 50- year return period for the three Road 19 sections. It can be observed in this table that the hourly precipitation adopted for sections I and III are similar, while the precipitation adopted for Section II is greater since those values include a climate change effect.
27. It is important to note that even though the factor used to account for climate change is in the vicinity of 10 %, due to the nonlinearity of the hydrologic system response the final effect on peak flows will be greater than this percentage. However, in spite of these differences it is unclear why the consideration of climate change was restricted to Section II. This again demonstrates a lack of coherence among the basic criteria used in the hydrological studies for the three NR 19 sections.

**Table 1. Hourly precipitation (mm/h)**

Section	Return Period (years)	
	25	50
I	70	80.5
II	78	87
III	71	79

Source: Gobierno de Santa Fe (2006)

**Figure 6. Depth-duration-frequency curves Rafaela rain gage station**



Source: Gobierno de Santa Fe (2006)

## 2.2. Spatial variability

28. Intense rainfall is unlikely to be distributed uniformly over a middle size watershed. For a specified frequency and duration, the average rainfall depth over such an area is less than the depth at a specific point. To account for this phenomenon, rainfall at a specific point (the “point value”) is converted into average rainfall over an area (the “areal-average depth”) by multiplying by a given correction factor. However, in accordance with the recommendation of the World Meteorological Organization, point values should be used without reduction for areas up to 9.6 sq. mi (25 km<sup>2</sup>) (USACE, 2001).
29. In the Project area around Road 19, there are several contributing areas up to the crossing points that have surfaces greater than 25 km<sup>2</sup> and require the application of a correction factor to transform point precipitation into an area-average depth. This permits the application of any hydrologic methodologies to compute the flood hydrograph associated with a given return period. To determine this correction factor, a depth-area-duration curve is needed (Chow et al, 1994), which is obtained by analyzing historical extreme storms.

30. None of the hydrological studies performed and carried out in the three Road 19 sections considered, at least in an explicit way, this type of storm analysis.

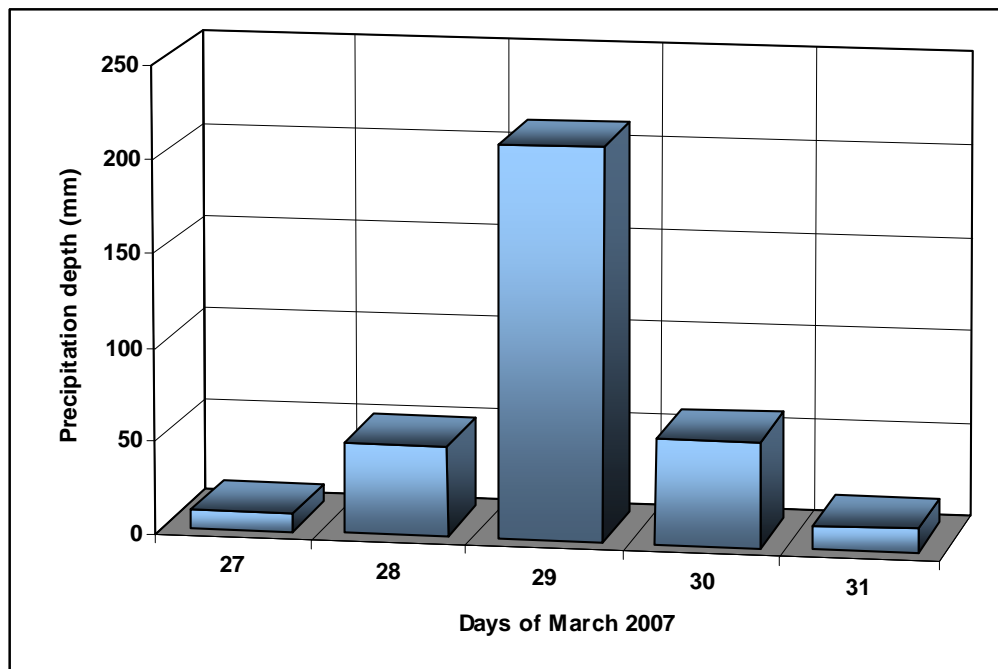
### **2.3. March 2007 extreme event**

31. At the end of March 2007, an unusual storm event occurred, flooding a vast area along Road 19, especially in the areas upstream of the road. In the critical points of *La Cañada San José*, *Arroyo Los Troncos*, *Arroyo del Sauce* and *Cañada del Sauce*, the water flowed over the top of the existing road. In Figure 7, the flooding characteristics can be observed. Figures 8 and 9, show the daily and hourly rainfall for the March 2007 storm events, respectively. Both sets of data correspond to that recorded at Rafaela rain gage station.
32. Even though the storm events occurred during the last days of March, the hydrological study for Section I conducted a probabilistic analysis that considered the total rainfall accumulated during March (i.e., a monthly analysis). The study's conclusion was that this unusual event has a 70-year return period. However, without entering in the details of the probabilistic analysis, the only conclusion that can be drawn from this is that the total rainfall of March 2007 has a 70-year return period. As conducted, the analysis cannot lead to the conclusion that the particular storm event that occurred in March 2007 has the same (70 year) return period, since it only lasted 3 to 5 days.
33. On the other hand, the consulting firm for Section II used hourly data from the March 2007 extreme event, and then applied a rainfall-runoff model to reproduce the flooding that occurred in *Arroyo del Sauce* and *Cañada del Sauce*. This study reached the conclusion that the return period for this event was in the vicinity of 200 years. This approach is more realistic than the former one, because it uses the hourly precipitation data of the whole event, and tries to calibrate a rainfall runoff model.
34. Analyzing Figure 9, it can be observed that the March 2007 storm event was produced by the joint occurrence of a sequence of storms; in other words, it was not an isolated storm but rather a cluster of several storms. This observation will be discussed in detail in the next section, as part of the discussion of selection criteria for rainfall-runoff models.

**Figure 7. March 2007 flooding. Picture taken by Hector Jullier**



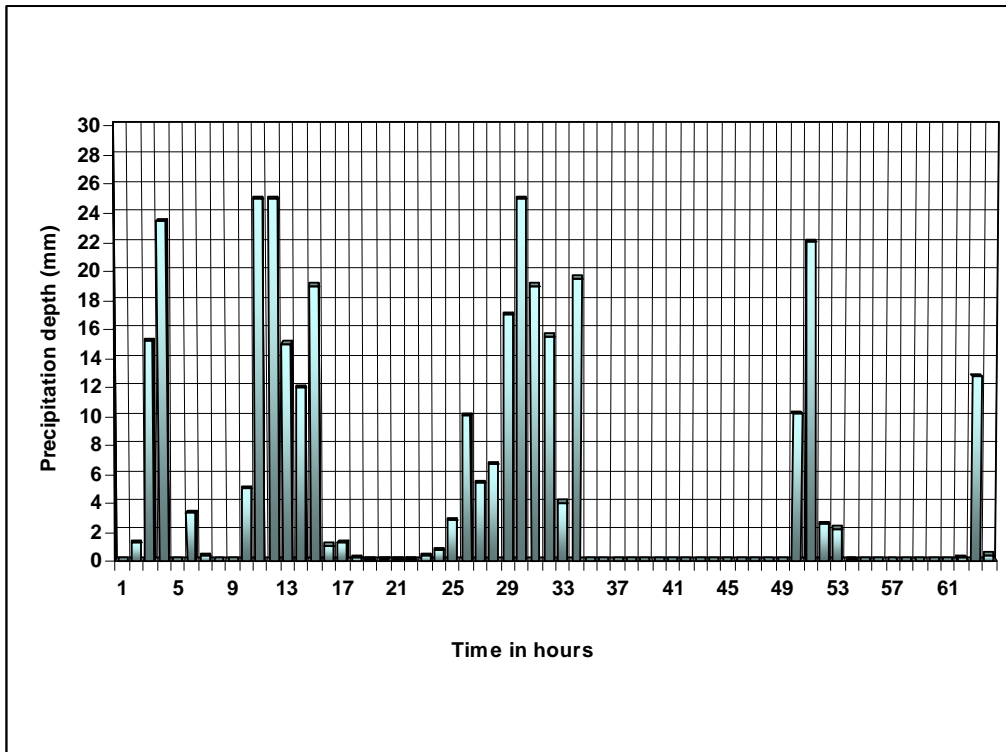
**Figure 8. Daily data of March 2007 storm -- Rafaela rain gage station**



Source: Cornero (2007)



**Figure 9. Hourly data of March 2007 storm -- Rafaela rain gage station**



Source: Consulbaires (2007)

### 3. Flood hydrograph estimation

35. In most of the small watersheds of sections I and II of the Road, the Modified Rational Method (Ruhle, 1966) was used to estimate the maximum flow generated by the design storm. This methodology yields only the peak flow rather than providing a complete picture of flood flows as a function of time (i.e., the flood hydrograph).

36. In middle size watersheds, which are the most important watersheds along the Road from the flooding point of view (in most of them, the water overtopped the road during the March 2007 floods), different methodologies were employed for each section of the Road. The Management Response, however, indicates that just one application methodology for all watersheds was used, the Modified Rational Method.

#### Applied methodologies.

37. **Section I:** In this section there are two watersheds that can be considered middle sized, “Cañada de San José” and “Arroyo Los Troncos”. In both watersheds the Modified Rational Method was applied, yielding the results shown in Table 2.

**Table 2- Peak Flow Calculations for Watersheds in Section I**

Waterway	Kilometer (*)	Area (km <sup>2</sup> )	Peak Flow (**) (m <sup>3</sup> /s)
“Cañada de San José”	9,884	46.44	26.0
“Arroyo Los Troncos” at “Los Cuatro Sauces”	22,850	196.8	50.0

Source; Cornero (2007)

(\*).- Drainage structure location, from the beginning of Section I.

(\*\*) 50 years return period.

38. **Section II:** In this section different methodologies were applied. For the watersheds under natural conditions, the Modified Rational Method was applied in all basins. However, due to the land use changes, drainage network modifications (due to drainage channel construction and channel dredging) and climate change effects discussed earlier, the characteristic parameters and design storms of these basins would change. For these reasons, in the contributing areas of “*Cañada del Sauce (Canal Principal de Santa María)*”, “*Arroyo del Sauce*” and “*Arroyo Colastiné*”, the Snyder Unit Hydrograph method was applied. Those basins are identified as C1, C2 and C3, respectively.

39. Additionally, to transform the design rainfall into “effective” rainfall, a Soil Conservation Service (SCS) method was used.

40. For reasons that are not explained in the reference nor in the interview with the Bank consultant carried out in World Bank office in Buenos Aires, the contributing areas of the C1, C2 and C3 watersheds have different values in the consultants’ report, as shown in Table 3.

**Table 3. Contributing areas of C1, C2 and C3 watersheds.**

Watershed	Contributing area in km <sup>2</sup>		
	Page 10 (*)	Page 14 (*)	Page 19 (*)
C1	290.80	290.80	339.17
C2	379.09	884.30	423.71
C3	199.48	199.48	199.48

Source; Consulbaires (2007)

(\*) Refers to the reference Consulbaires (2007)

41. The results obtained with the application of Modified Rational Method are expressed in a tabular way, while the results for the C1, C2 and C3 watersheds are shown through figures that contain the whole hydrographs.

42. Since the values of the hydrographs' peaks were drawn from these figures, they are just rough estimations, not exact values. These results are summarized in Table 4.

**Table 4. Peak Flow Calculations for Watersheds in Section II**

Waterway (*)	Area (km <sup>2</sup> )	Peak Flow (**) (m <sup>3</sup> /s)
C1, "Cañada del Sauce"	290.8 or 339.17	650.0 (***)
C2, "Arroyo del Sauce"	379.09, 884.3 or 423.71	650.0 (***)
C3, "Arroyo Colastiné"	199.48	460.0 (***)
C8	43.82	58.04
C14	38.28	46.60

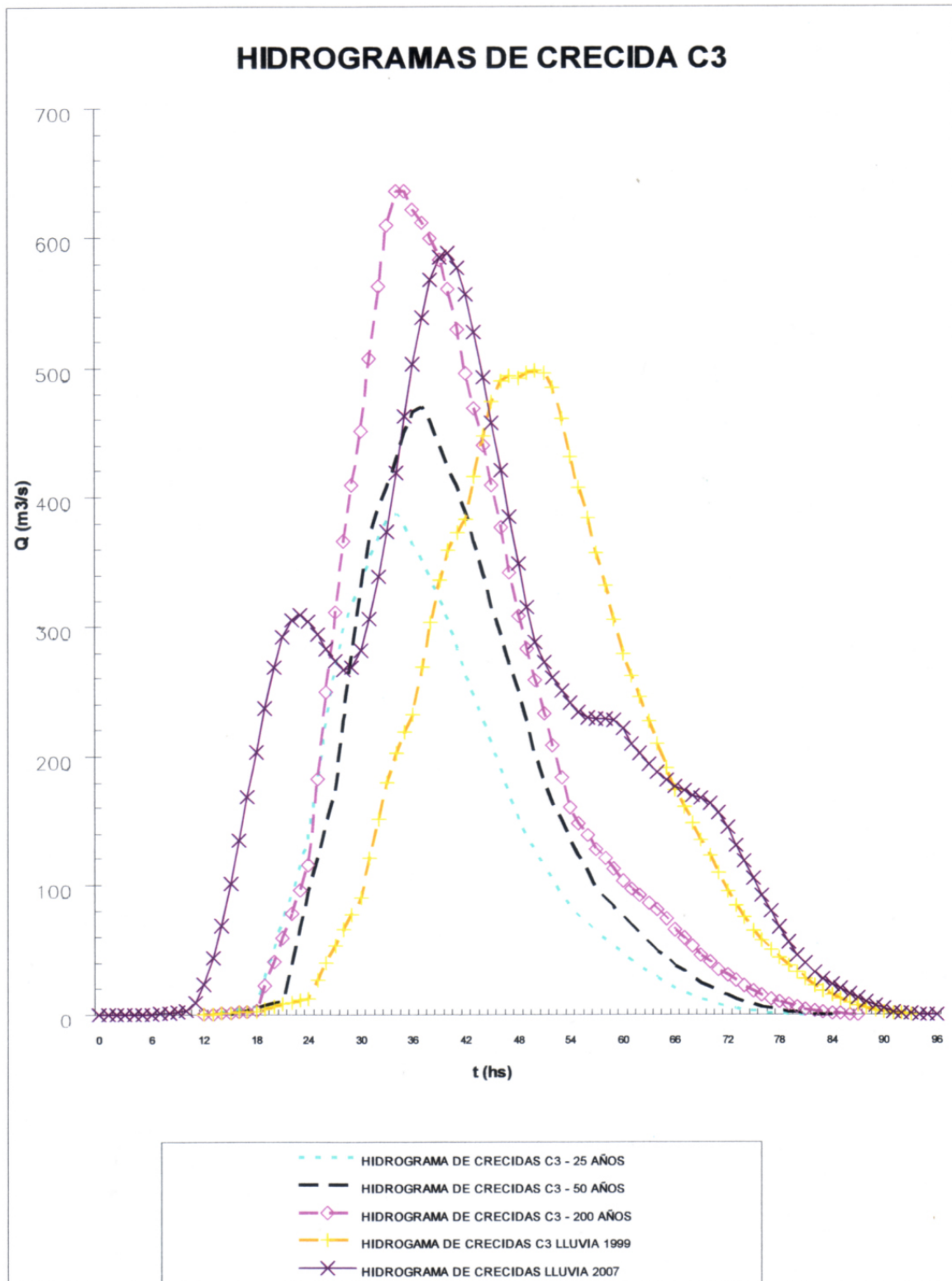
Source; Consulbaires (2007)

(\*) Their locations can be observed in the table on page 7 and the watershed map, both in Consulbaires (2007)

(\*\*) 50 years return period. (\*\*\*) Estimations

43. It is important to note that the effect of the magnitude of the peak flows generated in the "*Cañada del Sauce*", "*Arroyo del Sauce*" and "*Arroyo Colastiné*" (C1, C2 and C3) watersheds on the Project's cross drainage structures is described in these studies, concluding that the new Project could handle a peak flow of 1200 m<sup>3</sup>/s, and also an upper bound of 1600 m<sup>3</sup>/s. Additionally, the studies analyzed the flood hydrographs corresponding to the 25- and 50-year return periods, and the resulting hydrograph of the 1999 and 2007 extreme storms.
44. As an example, Figure 10 shows the flood hydrographs for the C3 watershed (Arroyo Colastiné), corresponding to the 25- and 50-year return periods and the resulting hydrograph of 1999 and 2007 extreme storms (page 38 of Consulbaires, 2008).

**Figure 10 - Flood hydrographs for the C3 Watershed**



Source: Consulbaires (2007)

45. **Section III:** In this section the Ar-Hymo hydrological model, which is an updated version of original HYMO model, was applied. Prior to applying the Ar-Hymo model, the effective rainfall amounts were obtained applying the Soil Conservation Society methodology, as was done in Section II.
46. It is important to note that in defining the watershed parameters, the presence of drainage channels built by the landowners and also the channel dredging works carried out were explicitly considered.
47. In this section of the Road, only two watersheds could be considered to be middle size, and they did not suffer flooding problems during the March 2007 extreme rainfall event. Table 5 provides data on the main characteristics of those catchments, including the peak flow for the 50-year return period.

**Table 5. Peak Flow Calculations for Watersheds in Section III**

Watercourse	Kilometer (*)	Area (km <sup>2</sup> )	Peak Flow (**) (m <sup>3</sup> /s)
“Cañada Las Yeguas”	80,956	477.21	136.90
311-B	112,693	40.23	25.72

Source: INCOCIV (2007) (pages 16 and 21)

(\*).- Drainage structure location, from the beginning of Section III.

(\*\*) 50 years return period.

### 3.2. Summary and discussion of flood hydrograph calculations.

48. As noted above, from the methodological point of view, the three consulting firms applied different approaches in middle size watersheds. The methodologies applied in Sections II and III are similar since they are based on the Unit Hydrograph Theory; and in both cases the SCS method was applied to estimate the effective rainfall. Additionally, the duration of the adopted storm for the analyses is greater than the time required for the entire watershed to contribute flows to the crossing point (i.e., the watershed concentration time) and the generated final result is expressed as hydrographs associated to a given return period.
49. The main difference relates to Section I, where a Modified Rational Method was applied. It is the opinion of the Panel’s Expert that applying this Method to a watershed as large as *Arroyo Los Troncos* up to *Los Cuatro Sauces* (close to 200 km<sup>2</sup>) presents a problem, in that the storm’s temporal variability is not properly considered. Precipitation is represented as a single value, expressed as rainfall depth in an hour associated to a given return period, which is then transformed, using an empirical equation, to estimate the mean rainfall intensity for a given time of concentration. It is important to emphasize that the Federal Highway Administration (2002) reference “Highway Hydrology” recommends the Rational Formula to estimate peak flows in small watersheds, and methodologies

based on the Unit Hydrograph Theory for estimating flood hydrographs in middle size basins.

50. To understand the complexities inherent in the temporal variation of extreme rainfall events, it is suffice to observe the graph of hourly rainfall of the March 2007 extreme event shown in Figure 9, and then compare this graph with the assumption made in the hydrological study of Section I (Cornero, 2007), where the 50-year storm event is represented using just one value,  $R_{50}=80.5$  mm/hour.
51. An additional problem of the application of the Modified Rational Method in Section I is that the result obtained is just the hydrograph peak flow rather than the whole hydrograph, which is needed to carry out the hydraulic routing through the cross drainage structures.
52. On the other hand, comparing the peak flow results in all basins, important differences appear. Although both the “Arroyo los Troncos” (Section I) and “Arroyo Colastiné” (Section II) watersheds have similar contributing areas (close to  $200 \text{ km}^2$ ), the peak flows for the 50-year return period are  $50 \text{ m}^3/\text{s}$  and  $460 \text{ m}^3/\text{s}$ , respectively (see Figure 10). Some differences would be expected due to variations in slopes, land uses, watershed shape, etc., but not of such an order of magnitude (almost tenfold).
53. Other differences are also found in the results. For example, the 50-year peak flow for C14 in Section II (see Table 4) is  $46.60 \text{ m}^3/\text{s}$ , with a contributing watershed of  $38.28 \text{ km}^2$ ; this peak flow is similar in magnitude to that of Arroyo Los Troncos ( $47 \text{ m}^3/\text{s}$  vs.  $50 \text{ m}^3/\text{s}$ ), but the contributing area is 80 % smaller.
54. These differences suggest significant uncertainty in the peak flow estimations.

#### **4. Hydraulic analysis of the drainage structures.**

##### **4.1. Basic hydraulic analysis criteria**

55. Two very important aspects have to be taken into consideration to perform a proper hydraulic analysis of the Project’s cross drainage structures. First, the areas surrounding these structures are very flat, upstream as well as downstream of Road 19. Second, the final Road 19 project (which includes phases one and two) will have three roads: the existing one, the first phase and the second phase project roads.
56. The first aspect implies that the hydraulic flow regime will be subcritical and as a result the hydraulic control is located downstream (i.e., flow through the Project’s cross-drainage structures would be governed by downstream conditions). This implies that in order to perform an adequate hydraulic analysis a good estimation of the downstream boundary condition must be made (see Box 1). Additionally,

- for a 50-year flood, the upstream flood flows will exceed the channel capacity and as a result it is highly probable that a temporary water storage area will be formed. For this reason, for a proper hydraulic analysis the flood hydrograph (determined through the hydrological studies) has to be routed through this water body (see Box 1).
57. The presence of three hydraulic structures that will allow the water to cross the three roads implies that the hydraulic analysis of this system has to consider all three structures.
58. It can be argued that, considering that the second phase will be implemented in a period of time longer than the useful life of the drainage structure, the third structure should not be considered in the analysis. However, even if this argument is accepted, there are still two structures operating in series (i.e., jointly), and therefore the hydraulic analysis should not be performed considering an isolated structure.
59. Figure 11 shows the “*Arroyo del Sauce*” crossing site, where the two cross drainage structures can be observed. The watercourse (lines in blues) crosses the proposed road (first phase of NR 19 upgrading project, parallel lines in black) and the existing road alignment (parallel lines in red).

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60. To support the previous comments, Box 1 contains five paragraphs taken from “Hydraulic Design of Highway Culverts”, Federal Highway Administration (2005).

**Box 1. Relevant paragraphs from “Hydraulic Design of Highway Culverts”  
Federal Highway Administration (2005)**

- Page 9: “A considerable volume of water may be ponded upstream of a culvert installation under high fills or in areas with flat ground slopes. The pond which is created may attenuate flood peaks under such conditions. This peak discharge attenuation may justify a reduction in the required culvert size.”
- Page 18: “Culvert performance is likely to be affected by the downstream water surface elevation or tailwater. Therefore, conditions which might promote high tailwater elevations during flood events should be investigated. Downstream impoundments, obstructions, channel constrictions, tidal effects, and junctions with other watercourses should be investigated, based on field observations and maps, in order to evaluate their impact on the resultant tailwater elevation. Lacking these conditions, tailwater elevations should be based on water surface elevations in the natural channel. These elevations can be accurately determined from water surface elevation calculations or estimated using simplified approximations of water depth.”
- Page 23: “Types of Control. A general description of the characteristics of inlet and outlet control flow is given below. A culvert flowing in inlet control has shallow, high velocity flow categorized as "supercritical." For supercritical flow, the control section is at the upstream end of the barrel (the inlet). Conversely, a culvert flowing in outlet control will have relatively deep, lower velocity flow termed "subcritical" flow. For subcritical flow the control is at the downstream end of the culvert (the outlet). The tailwater depth is either critical depth at the culvert outlet or the downstream channel depth, whichever is higher.”
- Page 44: “Using the combined culvert performance curve, it is an easy matter to determine the headwater elevation for any flow rate, or to visualize the performance of the culvert installation over a range of flow rates.” Figure 12 depicts an example of an overall culvert performance curve with roadway overtopping. In this figure the change from inlet to outlet control can be observed.
- Page 50: “4. Evaluation of Results. Compare the headwater elevations

calculated for inlet and outlet control. The higher of the two is designated the controlling headwater elevation. The culvert can be expected to operate with that higher headwater for at least part of the time.”

#### 4.2. Applied methodologies.

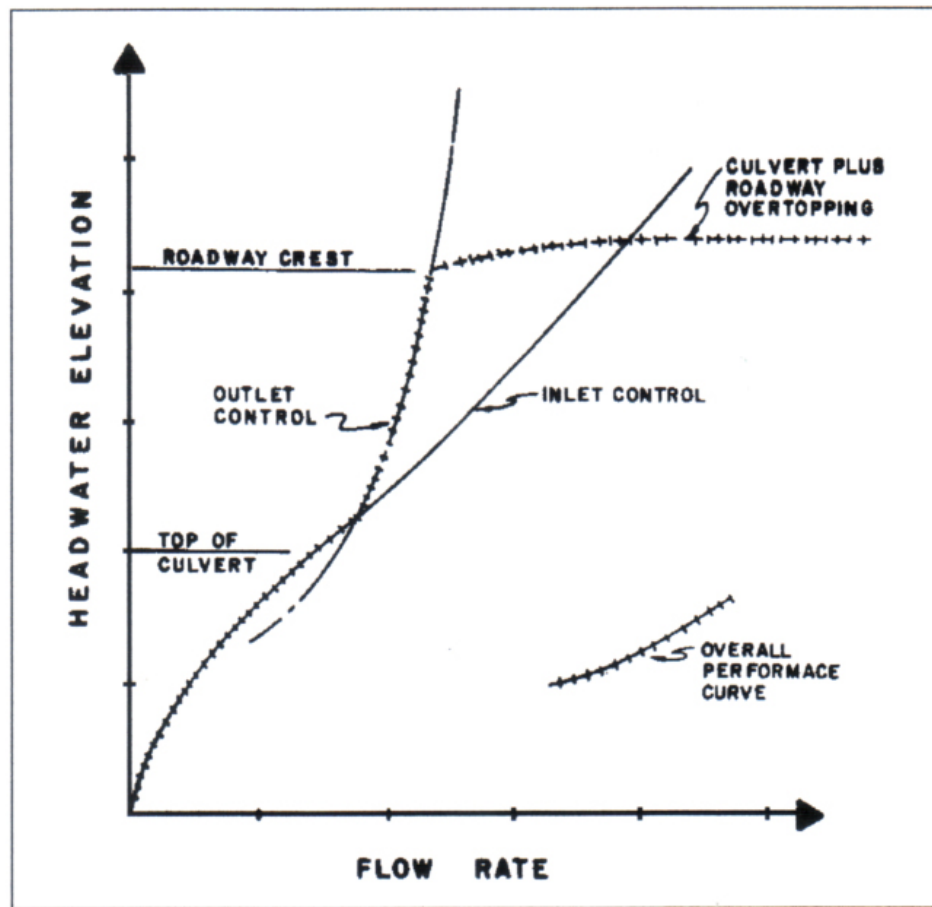
61. First of all, it is important to note that **all consulting companies performed the hydraulic analysis considering an isolated cross drainage structure**. A review of the reports of the various consulting companies shows that the hydraulic analysis of those systems did not explicitly consider a joint operation of a sequence of two or three drainage structures.

#### Section I:

62. The methodology applied in this Section has several shortcomings:

- There is no determination of the flood hydrograph and, therefore, the flood wave is not routed through the potential temporary water storage that could be located upstream of NR 19 when the 50-year events occur.
- The hydraulic analysis is performed considering an isolated drainage structure.
- The analysis made an a priori assumption that the culverts will operate having upstream control (inlet control). The photograph in Figure 13 shows the culverts (two culverts of 5 meters width, 10 meters as a total width) which are being built at *Los Cuatro Sauces* East site (proposed road). Figure 14 shows the channel located downstream of the existing road (which in turn is located downstream of the proposed road) that has a width less than 2 meters at the bottom and less than 3 meters in the upper section. This situation implies that there is a high probability that the drainage structure hydraulic control will be located downstream, and that the structures will probably work with a submerged outlet. In this case, a downstream hydraulic analysis would have to be performed in order to determine the proper boundary condition (inlet control or outlet control).

Figure 12- Culvert Performance Curve with Roadway Overtopping



Source: Federal Highway Administration (2005)

**Figure 13. Culverts at Los Cuatro Sauces**



**Figure 14. Downstream channel at Los Cuatro Sauces**



## Section II:

63. In this section, which concerns the two middle sized watersheds, a routing analysis was carried out for the March 2007 extreme event, assuming a temporary storage of water upstream of the crossing sites of *Cañada del Sauce* and *Arroyo el Sauce*, and trying to calibrate the model with the water levels observed during the event. After this calibration, the consulting firm concluded that the event has a 200-year return period. In addition, the firm made a comparison between the project situation and the current one, demonstrating the advantages, from a flooding point of view, of the proposed cross drainage structures.
64. To perform the routing analysis the consulting firm determined the elevation-discharge curve of the drainage structures, considering that these structures could operate with an inlet control (upstream) or outlet control (downstream). It is important to note that:
- In the hydraulic analysis, isolated drainages structures were considered. In other words, no consideration was made regarding the sequence of structures (see Figure 11).
  - During the interview carried out at the Argentina Bank Office, the consulting firm representative told us that a prior downstream hydraulic analysis was not performed in order to define the proper downstream boundary condition. Figure 15 shows a photograph of a channel located downstream of the *Arroyo del Sauce* crossing site, where it can be observed that the channel has limited capacity to discharge a design flow for a 50-year return period. The picture also shows the presence of a channel bend, greater than 90°, located a few meters downstream of the actual structure (see Figure 11; and a complete plant view in PA SI 15 drawing, in Consulbaires, 2007). Under these conditions, the only way of establishing a reliable value of the downstream boundary condition is to consider those limitations and building a backwater curve. To build this curve, a prior topographic survey has to be performed, in order to define the channel cross sections.
  - In the Consulbaires (2007) report it is not explicitly clear that the routing analysis performed for the March 2007 extreme event was also done for the 50-year design flow in *Cañada del Sauce* and *Arroyo el Sauce*, to test the drainage structure behavior. Additionally, it is not clear that a similar analysis was performed for the “Arroyo Colastiné” crossing site.



**Figure 15. View of downstream channel, at Arroyo Los Sauces crossing site, from Existing road NR 19 (see Figure 5.1).**



### **Section III:**

65. In this section the methodology that was applied presents several shortcomings:

- As in the previous sections, isolated drainage structures were considered in the hydraulic analysis. In other words, no consideration was made regarding the sequence of structures.
- The flood wave was not routed through the temporary water storage that could be located upstream of NR 19.
- A downstream hydraulic analysis was not performed in order to define the proper boundary condition.

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## GLOSSARY

**Culvert:** An open channel or conduit used primarily to convey flow under highways, railroad embankments, or runways.

**Discharge:** The volume of water that passes a given location within a given period of time. Usually expressed in cubic feet per second or cubic meters per second.

**Drainage basin:** Land area where precipitation runs off into streams, rivers, lakes, and reservoirs. It is a land feature that can be identified by tracing a line along the highest elevations between two areas on a map, often a ridge. Also called a watershed.

**Drainage network or drainage system:** In [geomorphology](#), a drainage system is the pattern formed by the streams, [rivers](#), and [lakes](#) in a particular [watershed](#). They are governed by the topography of the land, whether a particular region is dominated by hard or soft rocks, and the gradient of the land

**Evaporation:** The process of liquid water becoming water vapor, including vaporization from water surfaces, land surfaces, and snow fields, but not from leaf surfaces.

**Evapotranspiration:** the sum of evaporation and [transpiration](#).

**Flood:** An overflow of water onto lands that are used or usable by man and not normally covered by water. Floods have two essential characteristics: The inundation of land is temporary; and the land is adjacent to and inundated by overflow from a river, stream, lake, or ocean.

**Flood, 100-year:** A 100-year flood does not refer to a flood that occurs once every 100 years, but to a flood level with a 1 percent chance of being equaled or exceeded in any given year.

**Flood plain:** A strip of relatively flat and normally dry land alongside a stream, river, or lake that is covered by water during a flood.

**Headwater:** The water upstream from a structure or point on a stream.

**Hydrograph:** There are two meanings for hydrographs both coming from *hydro-* meaning water, and *-graph* meaning chart. A hydrograph plots the discharge of a [river](#) as a function of time. This activity can be in response to episodal event such as a [flood](#).

**Hyetograph:** A time-dependent function of rainfall intensity versus time.

**Intensity-duration-frequency curve:** A graph or mathematical equation that relates the rainfall intensity, storm duration, and excedence frequency.

**Isohyet:** A line on a map of equal rainfall depth for the same period of time, such as the duration of a storm.

**Peak flow:** The maximum instantaneous discharge of a stream or river at a given location. It usually occurs at or near the time of maximum stage.

**Precipitation:** Rain, snow, hail, sleet, dew, and frost.

**Rain gage:** A device-usually a cylindrical container-for measuring rain-fall.

**Runoff:** That part of the precipitation, snow melt, or irrigation water that appears in uncontrolled surface streams, rivers, drains or sewers.

**Storm:** Is any disturbed state of an astronomical body's atmosphere, especially affecting its surface, and strongly implying severe weather.

**Streamflow:** The water discharge that occurs in a natural channel. A more general term than runoff, streamflow may be applied to discharge whether or not it is affected by diversion or regulation.

**Subcritical flow:** Depths of flow greater than critical depths, resulting from relatively flat slopes. Flow of this type is most common in flat streams. A culvert flowing in outlet control will have relatively deep, lower velocity flow termed "subcritical" flow. For subcritical flow the control is at the downstream end of the culvert (the outlet). The tailwater depth is either critical depth at the culvert outlet or the downstream channel depth, whichever is higher.

**Supercritical flow:** Depths of flow less than critical depths resulting from relatively steep slopes. Flow of this type is most common in steep streams. A culvert flowing in inlet control has shallow, high velocity flow categorized as "supercritical." For supercritical flow, the control section is at the upstream end of the barrel (the inlet).

**Time of concentration:** The time at which an entire watershed begins to contribute to a given watercourse site (e.g., a road crossing site). In other words, it is the time required for a particle of water to flow from the hydraulically most distant point in a watershed to the outlet or design point.

**Tailwater:** The runoff from the lower end of a drainage structure.

**Unit hydrograph theory:** The basin outflow resulting from one unit of direct runoff generated uniformly over a drainage area at a uniform rainfall rate during a specified period of rainfall duration. The underlying concept of the Unit Hydrograph is that the runoff process is linear, so the runoff from greater or less than one unit is simply a multiple of the unit runoff hydrograph.

**Watershed:** The land area that drains water to a particular stream, river, or lake. It is a land feature that can be identified by tracing a line along the highest elevations between two areas on a map, often a ridge.

**Watercourse or Stream:** A general term for a body of flowing water, or a natural water course containing water at least part of the year. In hydrology, it is generally applied to the water flowing in a natural channel, as distinct from a canal.

## Annex D: Biographies

**Mr. Werner Kiene** was appointed to the Panel in November 2004 and has been its Chairperson since September 2007. He holds a Masters of Science degree and a Ph.D. in Agricultural Economics from Michigan State University. He has held leadership positions with the Ford Foundation and German Development Assistance. In 1994, Mr. Kiene became the founding Director of the Office of Evaluation of the United Nations World Food Programme (UN WFP). He was the World Food Programme Country Director for Bangladesh from 1998 through 2000 and also served as UN Resident Coordinator during this period. From 2000 to 2004 he was a Representative of the UN WFP in Washington, D.C. Mr. Kiene's focus has been on the design, implementation and assessment of sustainable development initiatives. His professional writings have dealt with issues of rural poverty and social services delivery; food security, agricultural and regional development; emergency support and humanitarian assistance; international trade and international relations. Mr. Kiene is involved in professional organizations such as the European Evaluation Association; the Society for International Development; the American Association for the Advancement of Science; and the International Agriculture Economics Association.

**Mr. Roberto Lenton** is currently Chair of the Technical Committee of the Global Water Partnership and a Member of the Inspection Panel of the World Bank. A specialist in water resources and sustainable development with over 30 years of international experience in the field, he also serves as Chair of the Water Supply and Sanitation Collaborative Council, Member of the Board of Directors of WaterAid America, and Senior Advisor to the International Research Institute for Climate and Society (IRI) at Columbia University. A citizen of Argentina with a Civil Engineering degree from the University of Buenos Aires and a Ph.D. from MIT, Dr. Lenton is a co-author of *Applied Water Resources Systems*. He is also a lead author of *Health, Dignity and Development: What will it take?*, the final report of the United Nations Millennium Project Task Force on Water and Sanitation, which he co-chaired. Dr. Lenton was earlier Director of the Sustainable Energy and Environment Division of the United Nations Development Programme in New York, Director General of the International Water Management Institute in Sri Lanka and Program Officer in the Rural Poverty and Resources program of the Ford Foundation in New Delhi and New York. He has served on the staff of Columbia University and the Massachusetts Institute of Technology (MIT), including posts as Executive Director of the IRI Secretariat for International Affairs and Development and Adjunct Professor in the School of International and Public Affairs at Columbia and Assistant Professor of Civil and Environmental Engineering at MIT.

**Mr. Alf Jerve** was appointed to the Panel in November 2008. He earned his Magister Degree in Social Anthropology and his Bachelor's degree in Environmental Science and Biology from the University of Bergen, Norway. As a Social Anthropologist with close to three decades of work in the field of development, he has been engaged in a wide range of development activities, including extensive field research in Africa and Asia. Among his assignments was a three year posting to Tanzania with the Norwegian Agency 84 for Development Cooperation as Coordinator of a rural development program. From

1993-1995 he was responsible for resettlement and rehabilitation issues with projects in Bangladesh during an assignment with the World Bank. In 1995 he became Assistant Director, and served as Director in 2005 and 2006, at the Christian Michelsen Institute in Norway, an internationally recognized development research institution where he has also devoted his energies and expertise to the research and analysis of a wide variety of policy and program issues affecting people in developing countries. Mr. Jerve has also led and participated in numerous independent evaluations commissioned by bilateral and multilateral development agencies, and served as a Member of the Roster of Experts for the Asian Development Bank's Inspection Function. His publications have focused on rural development, decentralization and poverty reduction and most recently on issues of ownership in development aid cooperation.

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### **Consultants**

**David Winder** received his Master's Degree and PhD from the University of Manchester, U.K. Dr David Winder's career has spanned the academic, non-profit and foundation spheres. After working as a United Nations volunteer in Chile he managed graduate programs, taught courses in public administration, social development planning and rural development policy and planning and conducted research at the University of Manchester's Institute for Development Policy and Management in England. He served the Ford Foundation as Regional Representative for Mexico and Central America based in Mexico City and as Regional Representative for Southeast Asia (Indonesia, The Philippines and Thailand) based in Jakarta. In that capacity he designed and managed multiple million dollar programs in international affairs, human rights and social justice, governance and public policy, rural development policy and education and culture. In over ten years in the field he managed a portfolio of over \$80 million in grant funds. Dr Winder has extensive experience in the non-profit sector as both a senior manager and advisor. At the Synergos Institute, a New York based international non-profit organization focused on building partnerships between corporate, non-profit and government sectors to address issues of poverty and social injustice, he implemented programs in Latin America, Southern Africa, Southeast Asia and India. In India he helped to forge a public private partnership for child nutrition between Indian and multinational corporations, Indian NGOs, UNICEF and the State Government of Maharashtra. On the Mexico-U.S border he led a team that built a partnership of community foundations committed to strengthening cross border collaboration in the field of community development. He also created a global Senior Fellows Program to enhance leadership skills in the development foundation sector. Dr Winder has served as an advisor to Oxfam UK, the Worldwide Initiative for Grantmakers Support, St. Antony's College, Oxford, the International Network for Strategic Philanthropy and Global Kids (New York). He has undertaken consultancies for international organizations and corporations such as the World Bank, the Population Council, the Inter American Foundation and Conoco Phillips Corporation. Dr Winder's publications include articles and book chapters on strategic philanthropy, the role of the non-profit sector in international development,

public-private partnerships, partnerships between government and the non-profit sector, land reform, rural development policy and development aid policy.

**José Rafael Córdova** received his PhD, in Water Resources and Hydrology, from Massachusetts Institute of Technology (M.I.T) in 1979; a Master degree in Civil Engineering, from Massachusetts Institute of Technology (M.I.T) in 1977; and a first degree from Universidad Central de Venezuela. He is a retired professor of Simón Bolívar University, in Venezuela, and, currently, he is a professor of graduate studies, in Hydraulic Engineering, at Universidad Central de Venezuela. He is also the Director of CGR Engineering consulting firm, in Venezuela. He has published more than 40 papers in Journals, Book Chapters and Conferences Proceedings; more than 230 technical reports related to hydrological and hydraulics studies; and has presented more than 50 papers in national (Venezuela) and international Congress, Conferences and Seminars. Dr. Córdova has participated in more than 250 engineering projects and consulting activities, in Venezuela, Bolivia, Costa Rica, Dominican Republic, Ecuador, Egypt, El Salvador, Greece, Guatemala, Honduras, Paraguay, Peru, Nicaragua and Yugoslavia.